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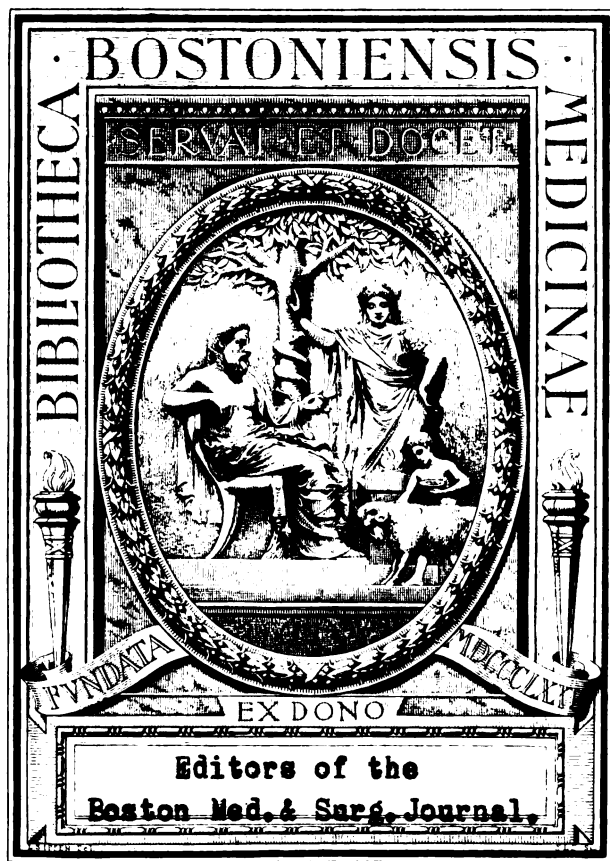
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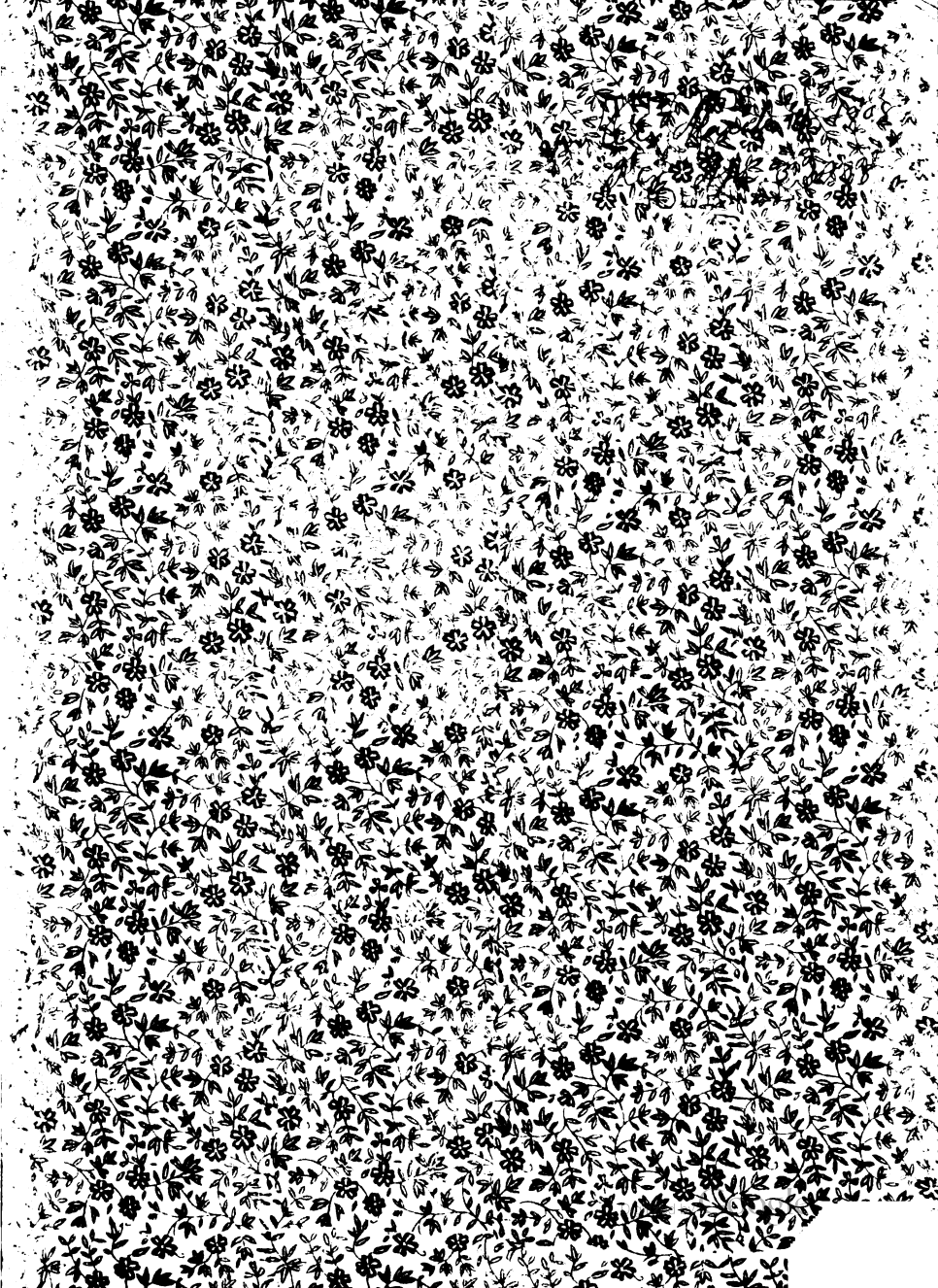


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PERSONAL HYGIENE
IN
TROPICAL AND SEMI-TROPICAL
COUNTRIES

ISAAC W. BREWER





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PERSONAL HYGIENE

IN TROPICAL AND SEMI-TROPICAL
COUNTRIES

A POPULAR MANUAL, WRITTEN FOR THE USE OF FOREIGNERS
RESIDING IN THE PHILIPPINES, CUBA, AND OTHER
PORTIONS OF THE TROPICS

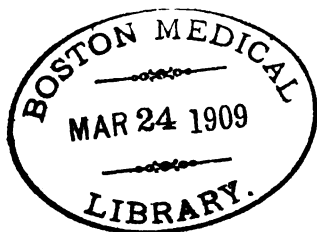
BY

ISAAC WILLIAMS BREWER, M.D.

Member of the American Society of
Tropical Medicine



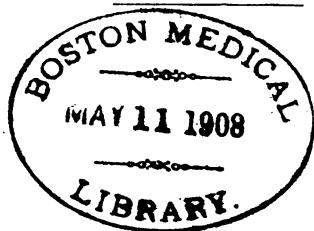
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TO
ROBERT M. O'REILLY, M.D.

SURGEON-GENERAL OF THE UNITED STATES ARMY. A SKILLFUL
PHYSICIAN, AN ABLE ADMINISTRATOR, AND A TRUE FRIEND

THIS BOOK IS DEDICATED

AS A SLIGHT TOKEN OF THE AUTHOR'S APPRECIATION

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INTRODUCTION.

THE colonization of the tropics has been the dream of the white race since the dawn of history. Nation after nation has endeavored to establish its people there, but one by one they have failed, and to-day the problem is still unsolved. What has been the cause of this failure? Some answer that it is the heat that kills. Others maintain that the intense light is the cause of the white man's decay in the tropics. These and many other theories have been advanced, and no doubt there is a basis of truth for most of them. To-day we know that failure to observe the laws of hygiene has in a measure caused the failure. That the native races thrive and multiply, living amid the worst hygienic surroundings, is not denied, but they appear to have, as a race, an immunity to their surroundings.

One has but to compare the health reports of any tropical city with those of European or American cities of the temperate zone, to be convinced that a large part of the sickness peculiar to the tropics is from preventable diseases.

The following table shows the average admission to sick report and the deaths, from the prin-

cial diseases, in the United States Army in the Philippine Islands and the United States for the three years ending with 1903:—

DISEASES	PER 1000 MEAN STRENGTH			
	UNITED STATES		PHILIPPINE ISLANDS	
	Admissions	Deaths	Admissions	Deaths
Typhoid Fever,	7.94	0.59	5.00	0.87
Malaria, . . .	90.15	0.07	482.07	1.00
Venereal, . .	148.95	0.03	158.11	0.04
Dysentery, . .	14.74	0.29	192.10	3.52
Diarrhœal, . .	82.69	0.00	284.71	0.26
All Diseases, .	1,117.09	4.82	1,804.46	15.08

By deducting the admissions from malaria, dysentery, and diarrhœal diseases from the totals in each case, the admission rate for the Philippines is but little over 6 per thousand greater than for the United States.

It is probably true that the white race can not become acclimated to the tropics. The experience of the English in India appears to prove that. Recently the Commissioner of Public Health for the Philippine Islands has published some statistics showing that the American employees lose from sickness, on an average, 4.80 days the first year of

their residence in the islands; 7.63 the second; 4.47 the third; 0.81 the fourth; and 0.03 the fifth. These statistics have been interpreted to mean that after a residence of two or three years the white race becomes acclimated. In reality, they indicate that after a few years the employees learn how to take care of themselves and that the careless and dissipated have either reformed, gone home, or died. To keep well is one thing, and to propagate an alien race in the tropics is another.

The civilized world recognizes that it is impossible to plant the white race in the tropics, and has given up the idea of colonizing. The great nations are now striving for the commercial supremacy, and are sending out much of their best blood to be the business men of the warmer portions of the globe.

Unlike the former invasions, the competing nations are now endeavoring to protect their citizens from the ravages of disease as well as from the hostile natives, and to accomplish this they have established laboratories and have sent out commissions to study the diseases of the tropics with special reference to their prevention. The results of these investigations are hidden in medical journals or in lengthy public documents that are not available

to the emigrant who stands in need of just such knowledge.

In the following pages are collected a few hygienic rules, based upon the experience gained by students of sanitary science in the tropics.

It is assumed that the average white man desires to do his work well with the least expenditure of vitality and without unnecessarily endangering his health; that he is willing to be put to a little trouble to attain that end. There are, unfortunately, a few persons who care little for their health, whose object is to enjoy the present, regardless of the bills that must be paid in the future. For such persons there is but the advice, "Do not go to the tropics."

Many of the statements are made with reference to conditions in that portion of the tropics in which the author has lived, and may require modification to make them adaptable to other localities.

The writer claims no originality, but has drawn freely from the works of Parkes, Manson, Ross, Simpson, and many others, to whom he makes acknowledgement.

The author is also indebted to Doctor J. F. Edwards, Superintendent of the Bureau of Health of Pittsburg, Pennsylvania, for reading the manuscript and for corrections and suggestions.

PREPARATION BEFORE SAILING.

Before embarkation for the tropics, one must make sure that he is in good health. It is well to be examined by a competent physician, preferably one who has had experience in the portion of the tropics in which you intend to reside.

It is especially important to have the teeth thoroughly examined and put in perfect order. It is very important to have all tartar removed, as it is an irritant to the gums; and as diseases of the gums are very common in the tropics, the less irritation in that region the better. Competent dentists are rarely found in the tropics, excepting in the larger cities.

The intense glare of the tropical sun during the dry season is very trying on the eyes, and slight visual defects that would go unnoticed in cooler regions are intensified; and as specialists in diseases of the eye are not found at every station, it is well to have the eyes examined before starting.

Small-pox is frequently epidemic in tropical countries, therefore it is wise to be vaccinated before departure. If properly vaccinated with good virus, there need be little fear of the disease.

The date of sailing should, if possible, be timed so as to reach the tropics during the most healthy season, which is usually the dry season.

Persons with tuberculosis, either active or arrested, and those with diseases of the stomach or intestines should avoid the tropics. Those who have had malaria, especially recent infections of the pernicious type, are especially warned about venturing within the tropics.

WHAT TO TAKE WITH YOU.

The equipment that is to be taken depends largely upon the capital that is to be invested, the tastes of the person, and the amount of baggage he is willing to pay for.

In this section it is not intended to make a complete list of everything that will be needed, but rather to call attention to certain things that may be forgotten and that will be found almost essentials.

An iron bed with a first-class wire spring should be taken. A thin, felt mattress to fit the bed will be a great comfort. Provide an ample supply of bed-linen and several thin, white blankets. A half a dozen galvanized iron washtubs will be very

convenient; they may be used for the bath when better tubs are not provided, and will always be required for the laundry. A small oil-stove that can be used for cooking will add greatly to one's comfort. They are serviceable for boiling water, and during the rains there are times when everything becomes saturated with moisture, and a little artificial heat to dry things out is desirable.

Have the trunks covered with iron and well painted, or the white ants will soon destroy them and their contents. Cover each tray with a piece of oiled silk or other waterproof material to keep out the moisture.

The subject of clothing is treated under that heading. Usually proper clothing can be purchased at the port of debarkation, but a few suits will be required during the latter part of the voyage and on landing. Good shoes are hard to get, and it is well to take along a supply of white canvas and tan ones and to arrange to have more sent out as required.

Put in your trunk a generous supply of tooth-brushes and some good tooth-powder, and be liberal with your toilet articles.

Nearly every one keeps house, and it is well to provide the necessary linen and tableware.

No matter how cold it may be at the point of embarkation, put thin flannels and a straw hat in the trunk, as they will be needed before landing.

EFFECTS OF THE CHANGE FROM A TEMPERATE TO A TROPICAL CLIMATE.

As a result of a change from a temperate to a tropical climate, we find that man's temperature is elevated about 0.5 degrees, that he generally loses weight, that the respiration and pulse are slower, that the action of the glands of the skin is increased. In time the skin becomes darker. At first the general effect of the climate is to stimulate the nervous system, causing a feeling of exhilaration. This is followed sooner or later by a depression which, if not properly treated, eventually results in a profound neurasthenia (nervous prostration).

The climate will not modify itself to suit the white man, therefore he must change his ways of living to suit the climate.

WORK AND EXERCISE.

During the period of exhilaration the new-comer laughs at the advice given by old residents. He sees in the natives an idle, worthless set, and

the white inhabitants appear lacking in enterprise. With an energy born in a cooler climate he is about at all hours of the day, and, if in a position of responsibility, endeavors to be a reformer and force temperate zone hours and methods upon the community. Sooner or later he will see his error and be willing to adopt the native hours of work and sleep.

It is a maxim in India that "only Englishmen and dogs are about during the heat of the day."

The native and the experienced white man arises with the sun, eats a light breakfast, and is early to his business, remaining there until ten or eleven A. M., when he closes up and returns home, has a bath and a light lunch about noon. This is followed an hour later by a nap (siesta) of an hour or so. Business is resumed between three and four, and continues until six, after which he enjoys a walk or drive, and about eight or nine has dinner, retiring about eleven. He takes his sleep as well as his work in divided doses, thus avoiding exposure to the sun and glare during the heat of the day.

As far as possible, we should conform to the native custom in the above matter. It is advisable to open the office as early as six-thirty or seven, and to close for the noon hour not later than eleven

A. M., re-open between three and four, and remain no later than sunset.

If possible, one should walk to his work in the morning and return on foot in the evening. After business it is advisable to ride or indulge in tennis, baseball, or athletic games.

Lack of exercise is a besetting sin in the tropics.

VACATIONS.

The weekly holiday or half holiday should be utilized for a visit to the surrounding country or for a trip on the water. Longer vacations should be allowed and taken each year. They should be of such duration as to allow at least one month in a cool climate. The United States Government allows the employees of the Panama Canal six weeks a year, which enables them to enjoy a full month at home.

Fall and winter appear to be the best seasons for a vacation, as there is then a complete change of climate not attainable in summer.

One should endeavor to arrange some variety for the hours of recreation. Monotony is one of the direct causes of discontent and sickness in the tropics. It usually drives young men to the clubs,

where the monotony of drink soon finishes the wreck of their health.

Nostalgia (homesickness) is a predisposing cause of many diseases and is liable to attack almost any emigrant, especially if his post be a lonely one. Therefore one should endeavor to interest himself in his surroundings and the people of the country. It is well to arrange for a regular supply of periodicals and books, and to devote a certain portion of one's leisure to mental training. A camera or a sketching case will afford amusement for many idle hours.

CLOTHING.

Much discomfort and not a little illness are caused by being improperly clothed. Generally the white man is either too warmly or too coolly clad. It is true that the native costume frequently consists of but a cotton shirt and trousers, but it must be remembered that the darkness of his skin counts for something.

Light woolen garments or a mixture of wool and silk next the skin seem to be the most suitable for the white man. Such clothing prevents too rapid cooling of the body and, if of a dark color,

will arrest many of the chemical rays of light, which is desirable. Many persons not accustomed to wool will experience some little discomfort at first, but the skin soon becomes accustomed to the slight irritation. Where the irritation is very great, it becomes necessary to wear a gauze garment between the skin and the wool. The outer garment worn during the day should be of cotton drill or white duck; after sunset a heavier garment is often required. A London firm has recently placed upon the market a cloth that is scarlet on the inside and khaki on the outside. This bids fair to be a most serviceable fabric for field wear. The khaki is not so readily seen as other colors, and the scarlet interrupts the chemical rays, which may be responsible for much of the nervous trouble in the tropics.

The coat should have a plait down the back, or it may have a pad sewn in it, to protect the spine.

When exposed to the sun wear a high-crowned, broad-brimmed pith hat, that protects the back of the neck as well as the temples. The outside should be white or yellow; Duncan recommends that the lining be of scarlet. A green lining to the brim is very grateful to the eyes. Major Woodruff suggests a lining of tinfoil as a protection from the chemical rays. The cork helmet is best for wet weather. The

hat should be ventilated in the top and the band should only touch at a few points, thus allowing a circulation of air around the head. Where an ordinary hat is used, a few succulent green leaves placed in the hat will greatly reduce the liability to sunstroke.

White canvas or duck shoes are better ventilated and much cooler than leather, and should be worn excepting when traveling where there are no roads. Leather shoes, although hotter, are better for field work. Boots are too hot, but a wide-meshed canvas legging should be worn as a protection against the brush and the stings of reptiles and insects.

Light woolen socks are the best. When exposed to the weather during the rains, it is hardly possible to keep the feet dry. As long as one is exercising, wet feet are not injurious, but when the exercise is over the wet garment should be promptly changed. It is useless to render the shoes waterproof, as they are so poorly ventilated that the feet become macerated.

In many parts of the tropics a light blanket is required, especially towards morning, and it is advisable to sleep in a very thin woolen pajama. During sleep the abdomen should be protected from

cold. The "cholera belt" so widely recommended was discarded in the Philippines, as it was found to be very uncomfortable and usually became a string before morning. A daily change of underclothing is very desirable; the shoes also should be changed each day if possible.

LAUNDRY.

The methods of the native washer-woman are crude and open to many objections. As a rule, she washes in the nearest stream or mud-puddle and rarely uses soap. The clothing is usually spread out to dry on the nearest plot of grass, but if none be available, any level spot suffices. Usually the ground around the washing places is badly polluted by the excreta of human beings and animals. Many of the parasitic skin diseases are transmitted in this way, especially the parasite of "dhobie itch."

If possible, all excepting the woolen clothing should be boiled after having the dirt washed out. Experience has demonstrated that the native women cannot be trusted to do that properly. In the Philippines I had the washer-woman come to the house and provided her with tubs, boiled water, soap, and clothes line, and saw that she used them.

It is well to make sure that the woman is not infected with skin diseases.

WATER.

The question of water supply is a most important one in tropical countries. In some of the larger cities modern water systems have been installed, but in many instances no attempt at purification is made, and in the tropics it is safe to consider all water infected, especially with the amoeba, which is one of the causes of dysentery. Musgrave has shown that this animal abounds in the Manila tap-water.

As a rule, drinking water is obtained from shallow, uncovered wells, the surrounding ground being the public laundry and bath. Each person provides his own bucket and string, and is not particular as to the cleanliness of either. In India the well-bucket has been shown to be a great factor in the spread of cholera.

Where there is a stream, the native draws his water from it. It also serves as a public laundry and bath for the inhabitants living on its banks. It is not uncommon to see a native drinking from the stream a short distance below a group of bathers.

Cisterns are found in many localities, and if properly built and cared for they furnish excellent water. They are, however, not recommended, as the water is liable to become contaminated while in storage, especially if the tank be below ground.

A good cistern should be cement-lined and so arranged that it can be thoroughly cleaned. The cover should fit tightly, so as to exclude all light and insects and small animals. It must be above ground.

A roof forty feet square will yield nearly one thousand gallons for each inch of rainfall, irrespective of the slope of the roof.

The first flow of water from the roof contains the impurities that have accumulated since the last rain and should be rejected. The overflow pipe should discharge into the open air, never into a sewer or drain, and the openings must be screened.

In general, cistern water must be considered as suspicious.

The most satisfactory method for domestic purification of water is by boiling for at least twenty minutes. The water must actually bubble for that length of time. One should personally superintend the operation, as the native servant can not be trusted to do it properly.

Giles suggests that the water be boiled on a stove that can be set on the veranda, or in the dining-room, where the master of the house is able to watch the process during the meal hour without inconvenience.

If possible, boil it in the vessel in which it is to be cooled. An unglazed earthenware jar is very satisfactory. In such a vessel the water boiled in the evening will cool by morning, provided it be hung in a draught.

Where ice is available, the water should be placed in bottles with hard rubber stoppers that have been boiled, and kept on the ice. If the bottles are partially filled and are well shaken, the water will become aerated and the flat taste, which is so unpleasant, is obviated. Never place ice in the water. Even when made of distilled water, ice is liable to become contaminated in handling.

Boiled water is frequently turbid, but under no circumstances should it be filtered. The suspended matter will usually settle before the water becomes cool. There is great danger of contamination while passing through the filter. When the water is muddy, it may be strained or filtered before boiling; but never afterwards. A small crystal of alum, six grains to the gallon, stirred into the

water will cause a rapid precipitation of any suspended matter.

There are a number of excellent filters on the market that have stood the most exacting bacteriological tests, but they require great care and sooner or later become infected.

The United States Army is using the Forbes sterilizer, which does excellent work when given proper attention. Servants are liable to turn the lamp up so high that much of the water is passed over before it has been boiled. The great advantage is that the sterilized water is returned at a temperature but slightly above the raw water that is placed in the machine. The small sterilizers used by the army yield about three hundred gallons in twenty-four hours.

The workings of the sterilizer are shown in the following diagram. 1 shows a water-tank with a pipe 2 through which the raw or unsterilized water enters and is allowed to fill the tank up to the water level x , but no higher, as it is restrained by the float-actuated valve shown in the tank. Should for any cause whatsoever the water rise above the level x , the excess will overflow through the waste-pipe 3. Starting from the water tank 1, in which the water has a fixed level, the raw water

flows down through pipe 4, then up through compartment 5 into the heater 6, and up the tube 7, until it reaches the level x . Above this it is impossible for the water to go under natural conditions.

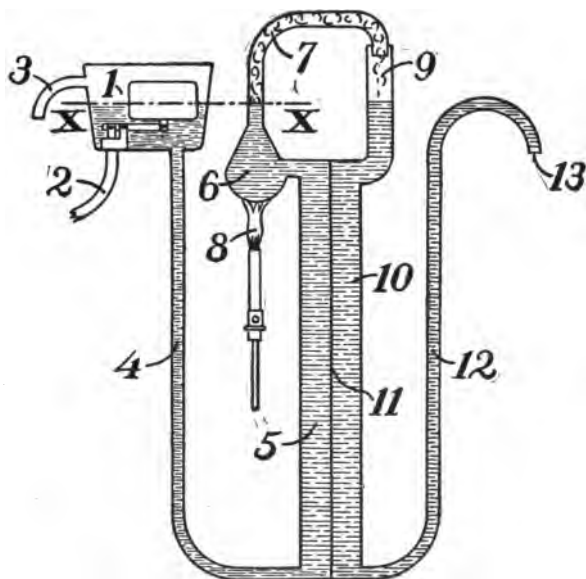


Fig. 1.—Forbes Water Sterilizer. (From a cut furnished by the Forbes Company.)

The burner 8 is now lighted and heat is applied under the heater 6, which causes the water in the heater to boil, and in boiling to rise in the tube 7 and overflow into the cup 9. It is impossible for

any raw water to pass from 7 to 9. The water is boiled but for a fraction of a second, and once the water has passed through the tube 7, it is removed from where heat can again reach it.

When the water has boiled over as stated above, the level in the heater 6 and in the tank 1 is lowered, and more raw water flows in, filling the tank to the level *x*.

The water continues to boil over into cup 9, quickly filling the compartment 10, where it loses its heat to the cold water on the other side of the thin metal partition 11. When 10 is filled, the water rises up in the pipe 12 and flows away through the pipe 13.

The manufacturers claim that the water discharged through 13 is but three degrees warmer than the water that is supplied to the tank 1.

Where kerosene oil costs eight cents per gallon, one hundred quarts of water can be sterilized for one cent.

Aerated waters are much used in warm climates and are a most refreshing beverage, but should only be used when their purity is above suspicion. Giles is authority for the statement that the gas in these waters will destroy the cholera germ in about a week.

Chemical purification is not satisfactory as a domestic measure. In India it is maintained that from one to two ounces of permanganate of potash added to wells will destroy cholera germs. The drug should be dissolved in a bucket and lowered into the well. If after an hour the well-water has a delicate pink color, it may be considered pure. If, on the other hand, the water be clear, more of the drug should be added. Such a method is subject to many objections, and if used should be repeated frequently, as the well is liable to be reinfected at any time.

BATHS.

A bath night and morning is almost essential in warm climates. The exact hour is of little importance, but a bath on returning from work is very refreshing, and a bath before retiring cools the body, soothes the nervous system, and is conducive to a pleasant night's sleep. With some, it is a habit to bathe on rising and again after the afternoon business hours. Cold showers appear to be too trying for the white residents of the tropics, but the tepid shower is to be recommended. Swimming baths are enervating and should be indulged in with great

moderation. Swimming pools are to be avoided, as they are frequently infected with cholera and other germs.

If possible, the water used for the bath should be boiled. Where this is impossible, care should be exercised lest any of the infected water enter the mouth, nose, eyes, or rectum. Enemas or douches of unboiled water must not be taken.

The hands and face should be washed in boiled water, and the same quality of water used for brushing the teeth.

FOODS.

In the tropics, more than any other place, one should be temperate in the matter of eating. Over-indulgence in food or eating of indigestible food causes a catarrhal condition of the digestive organs and predisposes to dysentery, typhoid fever, cholera, and other diseases.

The native custom of a light breakfast of bread, tea or coffee, and an egg on rising, with a light lunch of toast, salad, eggs, and tea or chocolate on returning from the morning work, is excellent. The heavy meal should be taken after sunset and may consist of the regular course dinner.

The natives live largely upon vegetables, rice, and fruits: Beef is rarely eaten, probably because it is scarce, but fish and chicken enter largely into their diet. Many persons, after studying the native and his diet, advise the white man to reduce the meat ration. This may be good advice in many instances, but a man's diet should be regulated by the work he does. According to Professor Chittenden's experiments, the majority of persons overeat, especially of beef. He kept active men in perfect health for five months on a restricted diet, and any one who leads a sedentary life has but to try his plan of gradually reducing the beef at two meals in the day to be convinced of the soundness of his advice.

Canned foods should be used sparingly. Their use for extended periods impairs the appetite and the digestion.

ANIMAL FOODS.

Beef is scarce. Native fowls are tough and the meat is of poor quality. When properly fed, there is no reason why they should not form an excellent substitute for beef.

Pigs are most unclean feeders and are usually

infected with parasites, and should not be used for food.

Fish abound in the tropical seas and form a very acceptable article of diet. All animal tissue rapidly spoils in hot climates and great care must be exercised to avoid eating tainted food, especially fish.

VEGETABLES.

Green vegetables are usually infected with the amoeba, which is one of the causes of dysentery. They should not be eaten raw unless sterilized. Musgrave has shown that lettuce and similar plants can be sterilized by the following method: Place on the ice until very cold, then plunge into water that is boiling and return to the ice-chest (not on the ice). Servants can not be trusted to do this properly. There are many edible plants used by the natives that should be found on the white man's table. Rice cooked after the method of the Chinese is an excellent article of diet and should be more used. When the grain is musty or has been stored in a damp place, it must not be eaten.

ICES.

Home-made ices are excellent and refreshing, and can be used in moderation during the heat of the day. They are not so good at meal time or during the evening. Those sold in the native bazaars are made of questionable fluids and are to be avoided.

Iced drinks are to be avoided or used with great moderation. Water that has been on the ice is cool enough for drinking.

MILK.

Good milk is hard to get in the tropics. The ordinary milk-peddler is a rather uncleanly person, and the article he sells is usually unclean and diluted with questionable fluids.

Many Europeans have the milkman drive the cow to the house, and superintend the milking. The native is too wily for that, and more than once has been discovered holding in his hand a sponge filled with water, which he squeezed during the milking, diluting the milk.

Goat's milk is very good, and a few of them can be kept at very little cost and, if properly fed, will give an excellent quality of milk. They are

most unclean feeders, and if allowed to roam the streets the milk is impaired in quantity and quality.

Goats are susceptible to many diseases, particularly Malta fever, and it is well to make sure that the animal is healthy before using the milk.

In the Philippines a very excellent quality of canned milk was imported from Australia. The process by which it was prepared is unknown to me, but apparently it was neither sweetened nor adulterated with drugs that affected the taste, and, when properly diluted, in taste it very nearly approached that of the fresh article.

THE USE OF ALCOHOL.

The use and abuse of alcohol in the tropics has been discussed with a great deal of feeling. The total abstainers and many others maintain that it is a deadly poison in the tropics, while others argue that it is an absolute necessity.

The truth lies between these extremes. Alcohol is a drug and should be used as such, and only on the advice of a physician and for a definite purpose.

There is no doubt that a little alcohol in the shape of a light wine taken with the meals is beneficial for those who suffer from loss of appetite or

inability to digest food. Parkes puts the daily amount of alcohol that may be consumed by a healthy man at from one to one and one-half ounces, or an equivalent of two ounces of brandy, five ounces of sherry, ten ounces of lighter wines, and twenty ounces of beer. Women should take smaller quantities.

Stimulation by alcohol may be required after prolonged exertion or after exposure to wet and cold, but it is to be remembered that the ultimate result of such stimulation is lowered vitality and reduced bodily heat, and is to be provided against by proper covering and food. Hot beef-extract, coffee, and tea often act as promptly and have no bad after-effects.

The abuse of alcohol is very common in the tropics. After the novelty of the new country has passed, one is tempted to spend more and more of his leisure in the clubs. This is the realm of brandy-and-soda or Scotch-and-soda, and a good fellow must needs take his glass with each arrival.

The limit of one and one-half ounces set by Parkes is soon passed. The result of such a course is a catarrhal condition of the alimentary canal, which predisposes to dysentery and other diseases of the intestines. Late hours at the club necessitate

sleeping late in the morning, and thus one loses the opportunity of exercising while it is yet cool, and goes to his work with reduced mental and bodily vigor.

Many of the native alcoholic drinks are very impure and cause much sickness.

Before going to the tropics, resolve to use no alcohol excepting at meals, and then only on the advice of your physician. Refuse to treat or be treated. This may make you unpopular with a certain class; but if one tells a good story and is sociable, he will find many friends who will respect his abstinence and admire him for it.

DWELLINGS.

The ideal location for a house in the tropics is the summit of a sandy knoll at least five hundred yards from any other dwelling and half a mile at least from any stagnant water. It should be shaded by tall trees that protect the roof without obstructing the breeze. The umbrella tree is ideal for the purpose. Such a location is not always available.

Preferably the house should be but one story, but elevated above the ground at least six feet. The roof should be double, with an ample air space be-

tween the roofs to insure coolness. This space must be screened, or animals will make it their home. The veranda should be from twelve to fifteen feet wide, and extend entirely around the house, with a roof that is continuous with that of the house proper. The veranda must be provided with blinds, to exclude the light during the heat of the day. The ventilation of the building should be through dormer windows and ventilators placed high in the roof, as well as through the windows and doors. The latter must be large and as high as the walls of the room. All openings that communicate with the outside air are to be screened with wire netting of nineteen strands to the inch, to prevent the entrance of mosquitoes and other insects. The partitions separating the rooms should not reach to the ceiling, but an air-space of at least a foot should be left, to insure proper ventilation.

The bedrooms are best located on the eastern side of the house, so that they may be aired and flooded with light as soon as vacated in the morning. Afterwards they may be closed up and allowed to cool off before the afternoon siesta. The walls of the sleeping rooms should never be exposed to the direct rays of the sun, or they will be very hot. They must have at least one thousand cubic feet of

air space per person. A room nine by twelve by nine feet gives about that amount.

The toilet is to be located in a detached pavilion on the opposite side of the house from the kitchen, but is to be connected with the main building by a covered passage. Unless modern plumbing is used, the bath should be in a separate room and its floor should be slightly higher than that of the toilet.

Too much care can not be devoted to the kitchen, which should be well ventilated and properly screened. If possible, modern plumbing should be installed. Musgrave has wisely suggested that all water used in the kitchen and pantry be passed through the boiler that should be a part of every kitchen range. This is only possible in houses having piped water. The refrigerator should be placed on a shaded part of the veranda, care being taken that the drippings do not form a puddle beneath the house. The refrigerator must be kept very clean by being scalded and wiped out frequently. The pipe that carries off the water often becomes choked with a mould, and it must be inspected and scalded very often.

Each room in the house should open on the veranda and have the windows and doors so arranged that there is at all times a good circulation

of air. The space beneath the building must not be used as a stable or a lumber room, but must be kept clean at all times. The posts upon which the house stands should be provided with rat-guards made of tin, and the steps must be similarly protected, or the building will be infested with rodents.

The water from the roof should be caught in eaves-troughs and conducted away from the house.

The surrounding grounds should have a gentle slope away from the building and should be paved for a distance of from fifteen to twenty feet. Beyond this should be the roadway, and then a well-kept garden or lawn. A thin screen of vines adds greatly to the comfort of the veranda. They are liable to harbor mosquitoes, but if no rank vegetation or stagnant water either in pools or in the leaves of plants be allowed around the premises the mosquitoes will not become a nuisance or menace to the health.

The building material is of no great importance, provided it keeps out the weather, insects, and rodents. Corrugated iron is hot and should have beneath it a false roof of light lumber, with an air-space between them. Thatch, palm-leaves, tiles, and adobe harbor rats and vermin and are objectionable for that reason.

Unless one has sufficient funds to build his own residence, he will be compelled to live in anything but an ideal house. In many tropical countries the houses are built in long rows, flush with the street. The lower stories are of stone and the upper, which frequently overhang the street, are of wood. Many of them are built around a court. The ground floor is often used for a stable and the buildings are nearly always hot and badly ventilated, the walls being fully exposed to the sun. The sanitary arrangements are imperfect or neglected, and rats and insects abound. The cottages of the poor are far preferable, provided they are isolated and the surroundings are not polluted. They can be made comfortable at little expense by the addition of verandas, bath, and kitchen. The bamboo floors that are generally found in such houses should be replaced by boards. All doors and windows that communicate with the outside air should be screened, and the space beneath the house thoroughly cleansed and several feet of earth replaced by pure sand. The cesspit should always be located before moving into the house. Frequently it will be found beneath one of the rooms, generally the kitchen. Such a building should not be occupied if a better one is available.

SERVANTS.

In every tropical house there are a multitude of servants, and unless carefully watched they become a menace to the health of the household. When off duty they congregate in the nearest booths or collection of native huts. Many of them are infected with skin diseases, and not infrequently their garments are contaminated with excreta and otherwise infected. Malaria is rife among them. During cholera, plague, and other epidemics they frequently bring the infection into the house.

In times of epidemics they should be prevented from mingling with other natives.

It is well to provide white cotton clothing and canvas shoes to be used exclusively in the house, and require them to lay aside the garments worn in the street before coming into the house. The street clothing should be hung in the sun until required again.

The cook requires careful watching. He is often untidy, and frequently entertains his friend the scavenger in the kitchen. This gentleman's clothing is always reeking with filth.

It is a good rule to allow no natives in the kitchen excepting the cook and the dining-room boys.

When possible, the native servants should be quartered in a separate building at some distance from the house. Their rooms should be properly ventilated and screened and kept very clean. Frequent inspections at unusual times are necessary to insure proper cleanliness, care being taken to explore all corners and other places where filth can collect. Unless this be done, the quarters will become a vile junk-shop.

A visit to the kitchen late in the evening will frequently discover the cook sleeping on the table.

Sick servants should not be kept around the house, but, if possible, be sent at once to the hospital.

DISPOSAL OF EXCRETA AND WASTE.

The question of the disposal of excreta and kitchen waste will come before nearly every white man before he has been long in a tropical country. The methods adopted by the natives are, as a rule, crude and unsanitary, and should be avoided as far as possible.

It is impossible to recommend any particular system that will suit all localities and conditions. I shall therefore discuss the most usual methods

adopted, pointing out their advantages and defects, and leave to each person the adoption of the system that seems most practicable in his location.

The following methods will be considered :—

Water carriage.

Privies.

Pail system (dry-earth system).

Latrines.

Brush system.

Water Carriage.

This is the system that is in use in most of the cities of the temperate zone. It requires a modern water-plant and a sewerage system. This is usually beyond the means of any one person or group of individuals, but occasionally, where water is piped into the house, it is possible to construct a short drain to some point where the sewage will not be a nuisance. The drain should not empty into fresh water, as most of the inhabitants of tropical countries use river water for drinking. If possible to use sewers, one should be sure that the plumbing is properly installed and trapped.

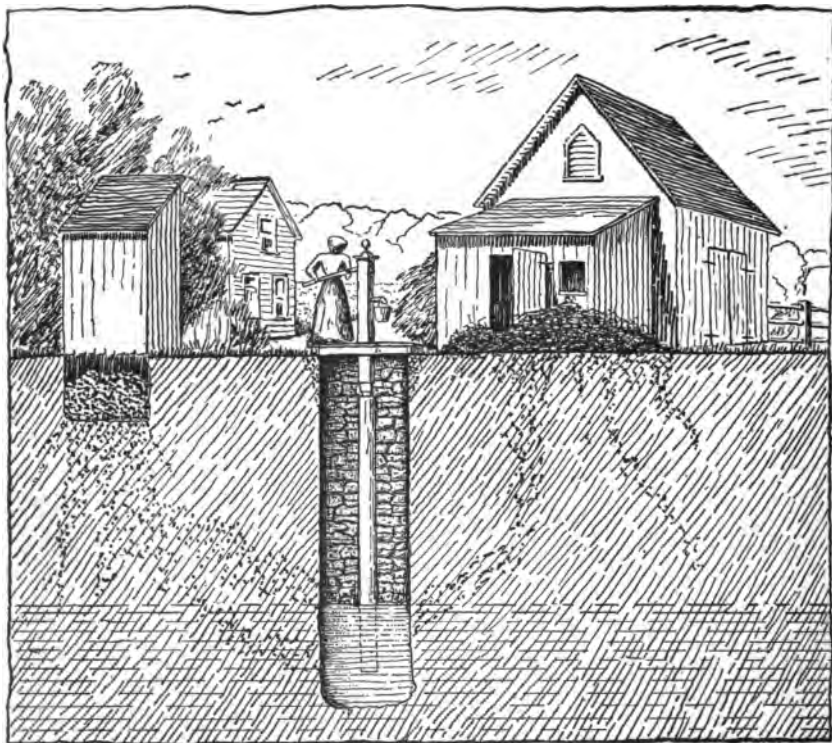


Fig. 2.—Shallow Barnyard Well, showing how it may become contaminated from the privy vault and the manure heap. (From Smith, *Farmer's Bulletin 43*, United States Department of Agriculture.)

Privies.

We are all familiar with the country privy, which consists of a deep pit over which is placed a small house. The excreta are passed into the pit, where they remain in a liquid or semisolid state until the pit is nearly full, when it is covered in with earth and another constructed. This method is open to the objection that it requires considerable ground, and that the subsoil is badly polluted and the liquid contents are liable to find their way into the adjoining well.

Where wells are not used and there is sufficient ground, they answer as a temporary measure; but where the rainfall is heavy they are liable to be flooded. The odor which makes them so unpleasant can be obviated by covering each stool with dry earth and ventilating through a shaft that extends well above the roof. The holes in the seat must be kept closed except when in use. This is easily arranged by having a projecting timber so arranged that the hinged covers can not be brought to the perpendicular. All openings should be screened, so as to exclude mosquitoes and flies. If there are flies or mosquitoes in the privy a little petroleum thrown into the pit each week will prevent them from breeding.

Pail System.

In this system the excreta are passed into pails which are removed once or twice daily, dumped, cleansed, and sunned, a clean pail being substituted for the soiled one. This system is extensively used in the tropics, and if properly managed there is little chance to pollute the soil or infect the water supply. Unfortunately, few but the very ignorant will undertake the job of scavenger, and through ignorance or criminal neglect the system frequently becomes very objectionable.

Pails may be made of wood, galvanized iron, or zinc, and should be oval in shape and of such size that they will not overflow during the intervals of emptying. In Manila, wooden pails, tarred on the inside, have been found to be most satisfactory. They are rendered odorless by being washed with milk of lime. Carbolic acid and other disinfectants are inferior to the lime.

The floor on which the pails rest must be of cement or other nonabsorbent material, in which there must be a slot to hold the pails in place. There should be a gentle slope towards the center and a steeper one towards the back. The room should be so arranged that the scavenger may ex-

change the pails from the outside without entering the house. The pail must fit close under the seat, so that the urine and fæces will not pass behind or in front of it and soil the floor.

The contents of the pails may be dumped into the sea, but usually they must be buried in shallow trenches that are immediately covered, some quick-growing vegetation being planted over the trench. The dump should be remote from dwellings and streams, and should not be in gravel or clay. Loam is the best soil for the dump.

Unless watched the scavenger will dump the pails in the nearest drain or in some depression, or omit to cover the contents with earth, the result being millions of infected flies. This is one of the ways that typhoid fever was disseminated among the British troops in South Africa during the late war. Frequently the scavenger spills the contents of the pails on the ground around the closet, and when washing the pails he is not very particular where the water is thrown. The householder must always make sure that he is doing his work properly, and should make frequent inspections. It not infrequently happens that the man forgets to put the clean pail in place.

Dry-Earth System.

This was extensively used by the United States Army in the early days of the occupation of the Philippines, and when intelligently managed was very successful.

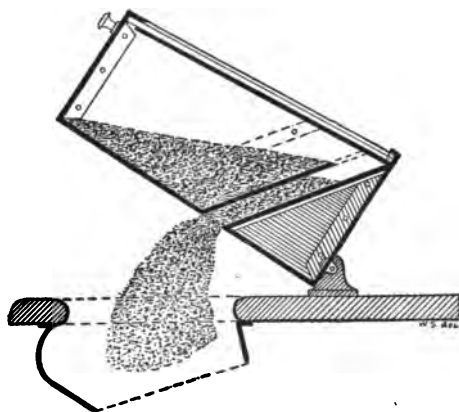


Fig. 3.—Self-acting Dry-earth Closet. The lid is replaced by hinged reservoir containing dry earth. Whenever this is let down a certain amount of dry earth is automatically thrown upon the faeces. (From Smith, Farmer's Bulletin 43, United States Department of Agriculture.)

In this system, galvanized iron drawers were placed under an ordinary box-seat, which was fly-proof and had self-closing covers for the holes. Finely pulverized, loamy, dry earth (not dried by

artificial heat), free from sticks and stones, was provided, and each person required to cover his stool as soon as voided. The amount of earth required per person varied from one and one-half to two and one-half pounds, according to whether the persons were beef-eaters or vegetarians. In many instances the stools were not covered, but by adopting the very simple device shown in the illustration this could be avoided. The success of the system depends in a large measure upon the action of the bacteria that are found in the upper layers of the soil; therefore no disinfectants should be placed in the drawers.

The drawers are removed morning and evening, washed, sunned, and replaced by clean ones. The contents are buried under the same condition as the contents of the pails. There is less liability of polluting the surrounding soil or the water supply when this system is used, and if managed by intelligent persons, who fully understand the importance of sanitary measures, it works well.

Latrines.

These are trenches dug in the ground. They are usually about four feet deep, three feet wide, and as long as may be necessary. They are but

temporary makeshifts, and are open to most of the objections of the privy and many more. They must be protected from flooding, and each stool must be covered as soon as passed, otherwise the flies will spread any infection they may contain far and wide. This was the way most of the typhoid fever that caused so many deaths in our army camps in 1898 was disseminated. The front of the trench is always contaminated by urine, and the back is frequently covered with feces. In the rainy season they become cesspools, and should not be used when other methods are available.

Brush System.

This is the usual method of the native. He selects a secluded place convenient to his dwelling or work, and passes his excrement directly on the ground without covering it. It is surprising how little nuisance this creates, provided there is ample ground to accommodate those who use the place. When a large number use the same ground, the stench is very offensive. The bugs and other scavengers, including the hogs, attack the stool as soon as voided, and within a comparatively short time it has disappeared. If the stool were covered,

the system would be that given to the children of Israel by Moses in the twenty-third chapter of Deuteronomy; and at the beginning of the twentieth century we can give no better advice to those who live a nomadic life in a warm country.

The difficulty of the system as followed by the native of hot countries is that the stools are not covered, and they become a feeding place for flies, which soon spread any infection that they contain. There is also danger of polluting the water supply.

Cesspools.

These are practically privy-vaults into which the sewer pipes from the house discharge. They are frequently mere holes in the ground, through which the liquids seep away, leaving a small residue of solid matter. Such a vault is very unsanitary, but will last for years.

If used, cesspools should be made of brick or stone laid on a solid foundation of concrete and cemented on the inside and out. The top is provided with a tight-fitting manhole, through which the contents can be inspected. Locate the pit where the scavenger can drive his cart directly to it; otherwise he will soil the ground between the pit and the

cart. The pit should be emptied very often and the inside examined for leaks; and if any are found, they must be repaired at once.

In general, cesspits are not recommended, although a recent authority in the British Army Medical Corps has commended them most highly.

DISPOSAL OF REFUSE AND SLOPS.

Refuse, such as ashes, dust, stable-sweepings, empty tins, and similar things, should be kept in covered, rain-proof bins and carted away at frequent intervals, preferably every morning, and used as filling for depressions in the ground. Cans should be covered with earth, or they will collect water and become breeding places for mosquitoes. House-flies breed in stable-manure, and, unless dumped at a considerable distance from the town or dwellings, it should be covered.

The kitchen refuse may be fed to the poultry or to hogs, but whatever remains should be promptly buried, and care should be taken lest the ground at the feeding place becomes polluted. The slop-can should be of galvanized iron, with round bottom, and without cracks or crevices in which refuse can collect. The top must fit tightly and be

kept in place at all times. The outside of the can should be reinforced with wooden staves. It is best not to use the can at all, but to dispose of the refuse at once. Where there are no pigs or poultry, it may be burned in the kitchen range. If there be a good bed of coals and the substances be reasonably free from water, there will be no smell from the operation. Unfortunately, the native cooks do not take kindly to modern stoves, but prefer to do the cooking over their charcoal fires. In such fires it is impossible to cremate anything, and the refuse will have to be buried.

The waste water from the kitchen may be used, after being freed from grease, for watering plants and flowers in the garden. Poore throws it into a box or basket, filled with straw, that is set over a blind drain. The drain is from two to four feet deep and filled in with stones, broken pottery, etc., and has a gentle slope away from the house. On either side are planted trees and shrubs. These absorb the water and flourish accordingly. This system is not always satisfactory during the rains. The straw in the basket, and the basket itself, will have to be destroyed at frequent intervals.

DISEASES TRANSMITTED THROUGH THE AGENCY OF MOSQUITOES.

We are all acquainted with the mosquito. Until recently they were considered little more than nuisances, but during the last few years, as a result of the brilliant work of Sir Patrick Manson, Major Roland Ross, and Major Walter Reed and his associates, we know that they are the distributors of at least four tropical diseases.

Mosquitoes are found everywhere. In the arctic regions they appear with the first warm days of summer, while in the tropics they are always present.

From a hygienic point we are interested in but three of the many kinds of mosquitoes: the anopheles, which transmits malaria; the stegomyia fasciata, which transmits yellow fever; and the culex fatigans, which transmits dengue and the disease called filaria. Further research may incriminate others.

MALARIA.

Acute malarial fever is characterized by a chill and fever, followed by a sweat and a period without symptoms. This last may vary in length, but is usually forty-eight or seventy-two hours in duration.

This disease is very prevalent in the tropics, and, according to Surgeon J. C. Perry, it caused twenty-five per cent. of the deaths in the hospitals

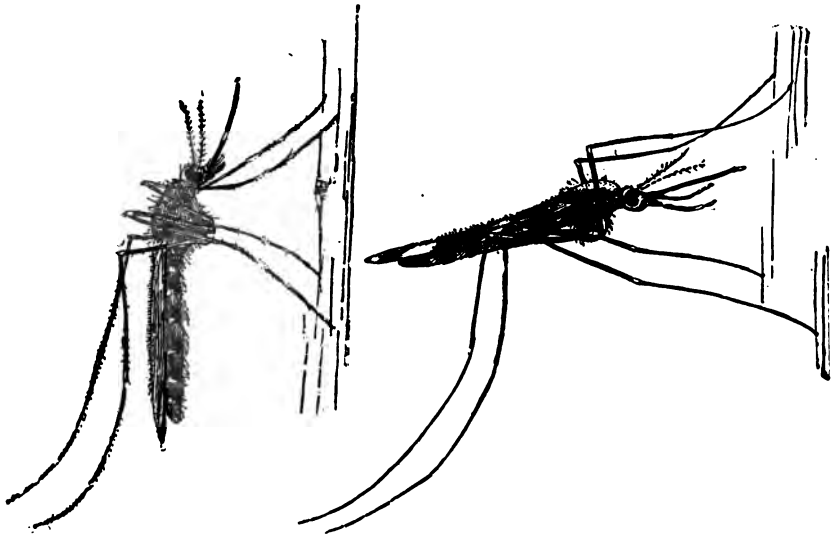


Fig. 4.—Resting Position of *Culex* (at left) and *Anopheles* (at right). (From Howard, Bulletin No. 25, Division of Entomology, United States Department of Agriculture.)

of the Panama railroad, prior to the arrival of the United States sanitary officers on the Isthmus.

Malaria is caused by a microscopic animal which passes a portion of its life in the red corpuscles of man's blood, which it destroys. The re-

mainder of its existence is passed in the body of a mosquito of the genus *Anopheles*. The infection is transmitted from man to man through the sting of the female mosquito, which becomes infected by feeding on the blood of persons who have the disease. (Male mosquitoes do not sting.) This is apparently the only way the disease is transmitted. In tropical countries it has been demonstrated that malaria is latent in the bodies of a large number of the native children, who furnish a never-failing source from which the mosquitoes may draw their infection.

Anopheles are usually brown or yellowish in color, with spotted wings and straight proboscis. They do not hum as much as some other insects. When resting on the wall their body is nearly at a right angle to the surface, and the head, body, and proboscis are in a straight line. The larvæ (wigglers), which are found in pools of clear water or the still water of sluggish streams, have straight breathing tubes and float parallel to the surface of the water, and when disturbed dart back and forth and sink with difficulty.

Anopheles lay their eggs in shallow pools, in the water of swamps or sluggish streams, and rarely in rain-barrels or cisterns. They will not lay in

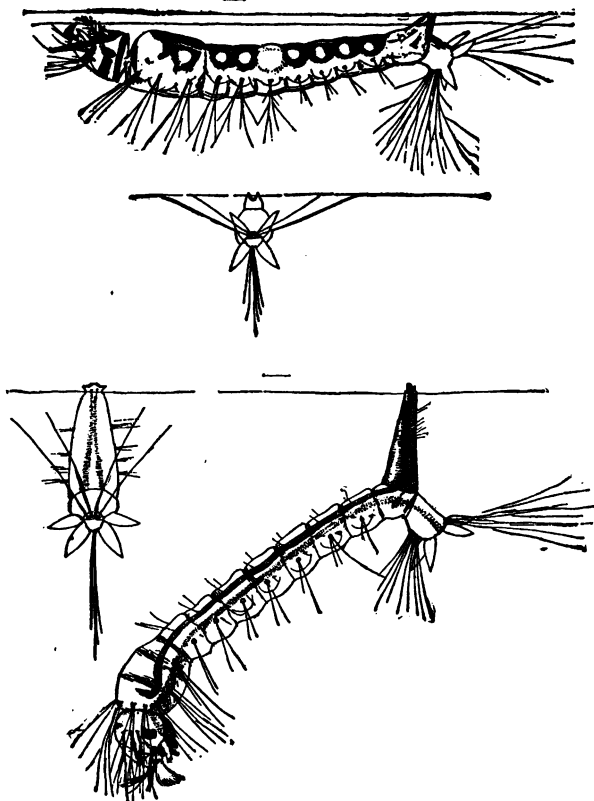


Fig. 5.—At top, Half-grown Larva of *Anopheles* (malarial mosquito) in Feeding Position, just beneath surface of water. At bottom, Half-grown Larva of *Culex* in Breathing Position. Greatly enlarged. (From Howard, Bulletin No. 25 N. S., Division of Entomology, United States Department of Agriculture.)

water that is covered with green scum or other vegetation. As a rule, they avoid collections of water that are shaded from the sunlight. They are not attracted by lights, and rarely fly more than a few hundred yards. Occasionally they have boarded vessels at a distance of half a mile from the shore, but generally the anopheles found in a house have been bred in its immediate vicinity, maybe in small pools in the grass or in the hollows of trees, or in the leaves of plants.

The time of the greatest activity is from just before sunset until shortly after sunrise, although when hungry they will attack any time during the day or night. They are found in all warehouses in the tropics, and in cellars they sting during the day. They avoid draughts, and during the day secrete themselves in the darker corners of the house or in the thick foliage of the garden. In cold climates these mosquitoes hibernate during the winter, usually in cellars of houses, and become dormant, but resume their activity with the first warm days of spring.

Persons sojourning in malarious countries should protect themselves from the stings of mosquitoes. Municipalities should also take measures to destroy the mosquitoes within their limits.

According to Major Roland Ross, the warfare against mosquitoes and malaria should be waged along the following lines:—

Personal precautions: Use of mosquito-nets; punkahs or electric fans.

Domestic precautions: Removal or protection of all standing water; protection of windows (and doors) with wire gauze.

Municipal precautions: Constant employment of a mosquito brigade for draining marshy ground and removing puddles; enforcement of proper sanitary regulations; cheap quinine; selection and treatment of cases of malaria.

Personal Precautions.

Chief amongst personal precautions is the constant use of mosquito-nets. In a malarious country (nearly every portion of the tropics is malarious) one should never be separated from his net. Travelers should, in addition to the large nets for beds, carry in their hand baggage a head-net for use in an emergency.

A good net should be rectangular (dome-shaped nets are very hot), slightly larger than the bed, with meshes about twenty to the inch. It should be long enough to allow of being well tucked

in beneath the mattress, with a facing of light cloth extending about six inches from the bottom, so as



Fig. 6.—A Properly Hung Mosquito Net. The sticks that support the net are a little too close together, allowing the top to sag a little. The net shown has but fourteen strands to the inch, which is too few to be of service against mosquitoes.

to protect the arms and legs in case they come in contact with the net while asleep. Hang the net on

the inside of the four corner posts of the bed and of such a height that one can sit up in bed. Under no circumstances should it be hung on the outside of the posts, nor should it reach the ground, as many mosquitoes spend the day beneath the bed and when the net is let down they are imprisoned within it. During the day the net should be folded or twisted in such a manner that the inside is not exposed. The slightest rent in the net should be repaired at once. The tropical mosquito is very persistent, and will find even the smallest opening long before morning.

When retiring one should enter the net quickly and through as small a space as possible, so as to prevent the ingress of mosquitoes.

Most persons enjoy sitting out on the veranda during the early hours of the evening, the time of the greatest activity of the anopheles. At this hour there is danger of being stung around the ankles or neck. The best protection is to enclose the veranda with wire netting, but where this is not possible one should sit near the electric fan or beneath the punkah.

A punkah is a rectangular frame covered with cloth, from which hangs a wide flounce. It is suspended from the ceiling by cords, and is kept in

motion by a rope passing over a wheel and pulled by a boy.

The ankles should be protected by high shoes, preferably of light duck, or by having the trousers held down by leather straps passing beneath the instep.

Women are especially liable to be stung by mosquitoes around the ankles, and around the neck when arrayed in low-neck dresses. Such garments are only to be worn where there are no mosquitoes.

The use of quinine as a prophylactic is recommended by many. It has been found that a daily dose of from ten to fifteen grains will prevent infection. It should only be used when one is unable to protect himself from mosquitoes. When nets are not available or when one has been stung by the insects, it is advisable to take ten or fifteen grains of quinine for a short time; but with proper forethought and care as to nets, such occasions should be rare.

Oil of pennyroyal, oil of lavender, and other essential oils smeared on the body have been recommended as protectives. In my hands they have proved valueless, and I have frequently observed a mosquito light upon my hand after it had been anointed with the drug and proceed to make a meal

at my expense. Mosquitoes do not avoid castor-oil plants, paw-paw, and sunflowers, but will keep away from the crushed leaves of the eucalyptus.

Domestic Precautions.

Every householder should see that there are no pools of water on his premises; that all rubbish, such as broken bottles and cans, that may retain water, is promptly removed; that all wells, cisterns, and rain-barrels are covered with fine wire gauze. The gauze should not touch the water, but be at such height as to prevent mosquitoes from getting at the water.

Privies and cesspits should also be screened, and in addition must be treated once a week with an ounce of petroleum for every fifteen square feet of surface. When it is impossible to screen barrels, cisterns, or other collections of water, they should be treated with petroleum in the same proportion. The oil forms a film on the water and prevents the mosquitoes from getting at it. Good drinking water may be drawn from barrels or cisterns so treated, through a spigot placed near the bottom. Mosquitoes frequently breed in flush-tanks of closets that are not in use. All tanks should be flushed several times a week or protected with screens.

Wire screening is not very expensive, and if possible all doors, windows, and other openings should be closed by it. Doors should be double and self-closing, and so arranged that it is impossible for both to be open at the same time.

The screens should be of fine copper wire, nineteen strands to the inch being necessary to assure protection from mosquitoes. They will also exclude flies, which are not only a pest, but carry the germs of many diseases, notably typhoid fever and cholera.

The screens must fit closely, be free from rents, and be kept closed at all times. Frequently mosquitoes and flies are found in houses that are properly screened. A few may have entered through the door as persons pass in and out, but generally it will be found that the native servants are in the habit of opening the screens during the cool of the morning, the very time when the mosquito is seeking a dark corner in which to spend the day. It is well to have as few movable screens as possible, and to watch them with great care lest they be left open.

Even when the house is carefully screened, a few mosquitoes will occasionally enter; therefore the darker corners should be frequently inspected, and if any insects be found the room should be

promptly closed up and fumigated with pyrethrum powder (insect powder), one pound being burned for each thousand feet of air-space. After two hours the room may be opened and the dead and stupefied mosquitoes swept up and burned.

When sojourning in hotels and other public places, it is well to look carefully for mosquitoes; and if any be found, the room should be promptly fumigated by pyrethrum as given above.

Gardens are almost a necessity in the tropics. The bright flowers and ornamental shrubs please the eye and help to relieve the monotony, especially during the dry season, when the fields are dry and parched. A garden must be so managed that it does not become a breeding place for mosquitoes. No stagnant water should be allowed. Heavy creeping vines and thick shrubs must not be placed around the verandas, as they are ideal resting places for mosquitoes and also cut off the breeze. A light growth of vines on the veranda is a most welcome shade and may be permitted where other measures to get rid of mosquitoes have been adopted.

Municipal Precautions.

These should be carried on upon an extensive scale, and should include, besides the ordinary san-

itary measures, the drainage of all swamps and the abolishing of all breeding places, whether in the suburbs or in the municipality.

More extended information will be found in an admirable manual by Major Roland Ross, entitled "Mosquito Brigades and How to Organize Them."

The value of such measures is well shown by the results obtained in the Federated Malay States, as reported by Doctors Travers and Watson in the "Journal of Tropical Medicine" for July 2, 1906, from which the following tables are taken:—

Malarial Cases Admitted to Klang Hospital.

RESIDENCE	YEAR				
	1901	1902	1903	1904	1905
Klang and Port Swettenham,	610	199	69	32	23
Elsewhere,	197	204	150	266	353
Total,	807	403	219	298	376

Fatal Cases of Malaria at Klang Hospital.

RESIDENCE	YEAR			
	1901	1902	1903	1904
Klang and Port Swettenham, . .	52	9	5	0
Elsewhere,	19	23	14	27
Total,	71	32	19	27

YELLOW FEVER.

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Number of Certificates and of Days of Sick Leave Granted to
Government Officers Resident in Klang and Port
Swettenham on Account of Malaria.

	YEAR				
	1901	1902	1903	1904	1905
Certificates,	236	40	23	14	4
Days of Leave, -	1,026	198	73	71	30

The campaign against mosquitoes was begun in Klang and Port Swettenham in 1902. The total cost to December 31, 1904, was about forty-two thousand five hundred dollars, most of which was expended in draining and filling about four hundred and thirty-six acres of land, which is now available for cultivation.

YELLOW FEVER.

Yellow fever is an acute and very fatal disease. It begins with a chill, followed by headache and high fever, with the development of jaundice on the third or fourth day.

It has been known in the West Indies since the time of Columbus. In recent years Havana, Cuba; Rio de Janeiro, Brazil; and the coasts of Central America and Mexico have been the great

centers of infection. From these points it has spread in great epidemic waves, infecting nearly all the large cities of the Atlantic coast from Boston

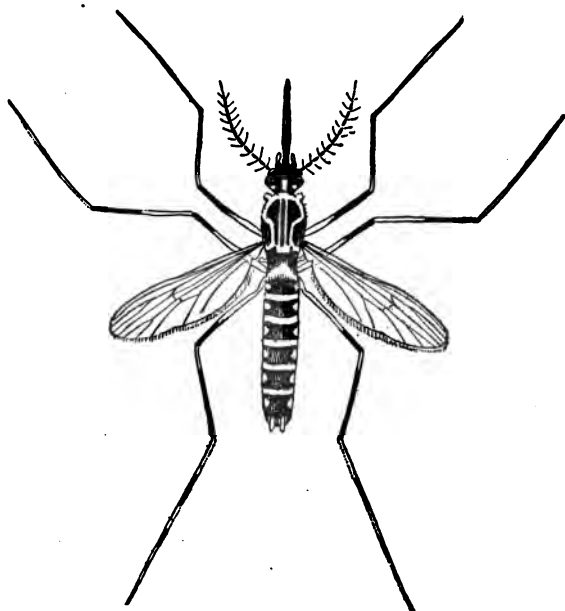


Fig. 7.—*Stegomyia Fasciata* (the Yellow Fever Mosquito).
(From Howard, Farmer's Bulletin No. 155, United States Department of Agriculture.)

to Montevideo. It crossed the Isthmus with the railroad, and Panama became an infected city, from whence it has at times spread to most of the cities on the Pacific coast of South and Central America.

The western coast of Africa appears to be a permanent focus of infection, and the disease has frequently appeared on the Mediterranean coast.

The cause of the disease is unknown, but it certainly does not develop from filth. Through the brilliant work of the United States Army Yellow Fever Commission, we know that the disease is propagated from man to man through the agency of a mosquito of the genus *stegomyia*.

Should a female mosquito of this species draw a meal of blood from a person ill with the disease and after an interval of twelve days sting a non-immune, the latter will, in about five days, show symptoms of the disease.

The most conspicuous markings on the *stegomyia fasciata* are the broad half-moon-shaped silver stripes on the side of the thorax and the white stripes on the legs, especially well marked on the hind legs. They are widely distributed throughout the tropics, and are found as far north and south as the thirty-eighth parallels.

Its larvæ have been found in rain-barrels, sagging gutters where water stagnates, tin cans, especially those placed under table legs to prevent the inroads of the ants, in cesspools, horse-troughs,

and the water that collects in the leaves of plants. Dryness does not destroy the eggs, nor does natural freezing, but freezing with salt kills them.

The stegomyia is a good sailor and breeds in the water-tanks of vessels as readily as on shore. They rarely fly far, but are often carried to vessels at anchor some miles from shore by lighters and other boats that ply between them and the docks.

For one hundred and fifty years prior to 1901 Havana had never been free from yellow fever. In February of that year Colonel Wm. C. Gorgas, then chief sanitary officer, began to act upon the discovery of Reed, and in less than nine months the town was free of the disease, although many cases had been imported from the surrounding infected area, and the susceptible population was rapidly increasing. Havana remained free from the disease until the fall of 1905, when the disease again appeared.

The campaign against yellow fever in Havana was conducted along two lines: first, the destruction of mosquitoes; and second, preventing the mosquitoes from becoming infected, by screening the rooms of those sick with the disease.

The warfare against the mosquito was carried along the lines mentioned under malaria.

As soon as a case was reported the sanitary department sent carpenters and disinfectors to the house. All the windows and doors were closed with wire gauze, leaving but one entrance, which was provided with spring-door of screening. The disinfectors closed all openings by pasting paper over all cracks, and fumigated each room, using one pound of pyrethrum powder (insect powder) for each one thousand cubic feet of air space. After an hour the benumbed insects were swept up and burned. Sulphur may be used in the same proportions. The adjoining houses were also fumigated.

A guard was posted over the door, his duty being to keep it closed. The patient was allowed to receive a limited number of guests and the quarantine was made as light as possible. What Colonel Gorgas did in Havana on a small scale he has repeated on the Isthmus of Panama on a much larger scale.

FILARIA.

Many years since, Doctor Patrick Manson demonstrated that the blood-worm (filaria), which is probably the cause of that most unpleasant disease, elephantiasis, was inoculated into man by the mosquito *Culex fatigans*. This mosquito breeds in

puddles, sluggish streams, rain-barrels, and other collections of water. The adults frequent houses.

The measures to be adopted to get rid of this mosquito and the means of avoiding inoculation have been given in treating of malaria. Quinine has no influence over the disease.

DENGUE.

This is an acute febrile disease, characterized by sudden onset, intense pain in the back and extremities, and an eruption on the body. The fever usually subsides in a few days and after an intermission of several days returns, subsiding gradually. It is not a serious malady, but the suffering is intense and it is frequently followed by severe neuralgia and other nervous troubles.

Dengue has always been considered an infectious disease, and at times attacks large numbers of persons. In Galveston, Texas, in 1897, there were twenty thousand cases in two months, and nearly every American who has resided in the Philippines has had a personal acquaintance with the disease.

The cause of the disease is unknown and the mode of its propagation is equally obscure. Graham has advanced the theory that the disease is trans-

mitted by a mosquito, *Culex fatigans*, and recent studies by Ashburn and Craig seem to confirm his observations.

In times of epidemics of this disease, it is well to avoid the infected area if possible, and in addition it would be wise to use a mosquito-net and take the other precautions given under the head of malaria.

MALTA FEVER.

Malta fever is a peculiar, persistent, recurring disease that is principally confined to the island of Malta, although it has been contracted in other parts of the globe. A number of cases have been reported from the Philippine Islands.

The germ of the disease has been found in the fæces, sweat, and urine of those sick with the disease, also in the milk of goats on the island of Malta. It retains its vitality for a long time when deposited in filth. It is supposed that human beings are infected through eating or drinking infected foods, although the exact way that the germ enters the body is not thoroughly understood.

The precautions to be followed in order to obtain a pure food supply have been given. In addition one should be particular about cleansing the

hands and face before eating, and should see that the servants who handle the food have clean hands and clothing. The general sanitation of the premises must be attended to.

TETANUS (LOCKJAW).

The germs of this disease are found in the soil, especially in gardens. In some portion of the Philippine Islands the disease is very prevalent. In the human body the germ can only develop in wounds that are not exposed to the air. Punctured wounds are the most dangerous; they should be opened and thoroughly disinfected with a solution of bichloride of mercury (one part to one thousand parts of water), or with a strong solution of permanganate of potash or peroxide of hydrogen. The wound should then be covered with sterile gauze and bandaged. In countries where the disease prevails, persons should not go barefooted.

DYSENTERY.

The group of diseases that pass under this name are characterized by frequent bloody and slimy stools, accompanied by much straining. This group of diseases is one of the principal causes of

invalidism in the tropics, especially among soldiers. The death rate is very high.

The predisposing causes are chilling of the abdomen, debility following fevers, the eating of unripe or overripe fruit and other indigestible foods.

There are several direct causes of the disease, or rather of the different diseases that are classified under this name. The principal cause of tropical dysentery is a small, unicellular animal, the amoeba. Another type of the disease is caused by a small plant, the germ of dysentery. Both of these gain access to the body through drinking water or contaminated foods, especially green vegetables that are eaten raw. They are discharged in the fæces, and are frequently carried to our food on the feet of flies. The disease may be contracted by using impure water for enemata and douches.

Prevention consists in disinfecting all the discharges from those sick of the disease with a solution of tricresol (one part to ten of water) or with a solution of bichloride of mercury (one part to one hundred of water). Where neither of these can be obtained, unslacked lime mixed with an equal amount of water and equal to the bulk of the fæces will do. The stool should be kept in contact with the disinfectant for at least thirty minutes, being

stirred from time to time, and then thrown into the closet or buried in a deep trench. The patient and the attendant should thoroughly sterilize their hands after each movement by washing them with soap and then using a disinfectant, such as a solution of bichloride of mercury (one part to five thousand of water).

By using nothing but boiled water and only eating green vegetables after they have been properly sterilized, the liability to contract the disease is greatly reduced.

DIARRHŒA.

Diarrhœa is a symptom of many diseases, especially the early and late stages of dysentery.

The following are some of the principal causes: The eating of improper food or overripe or green fruit, sudden chilling of the abdomen, drinking water that contains much vegetable or mineral matter in suspension, infection with animal parasites. The prevention consists in avoiding the cause.

CHOLERA.

Cholera is an acute specific disease characterized by pain in the abdomen, vomiting, frequent

watery stools, cramps in the legs, cold extremities, and rapid prostration. The progress of the disease is very rapid, and unless proper treatment is instituted death ensues in a few hours. Even with the best of treatment the mortality is very high.

The home of cholera is India. From there it has traveled by the trade routes, and at various times has spread to nearly every part of the globe. It has probably caused more deaths than any other disease excepting plague.

Professor Koch discovered in the discharges of cholera patients a small, comma-shaped bacillus, which has been proven to be the cause of the disease. It multiplies very rapidly in the intestines of human beings and causes the symptoms of the disease. It gains access to the body through drinking water or food that has become contaminated with the discharges of cholera patients. Food is often contaminated by flies, which, after feasting on the infected fæces, fly to the kitchen and walk over the food that the cook has carelessly left uncovered. Occasionally the germ is carried from the sick to the well on the hands or on drinking vessels.

During an epidemic of cholera extra endeavors must be made to maintain a pure food and water supply. No matter how pure the water used may

be, nothing but boiled or sterilized water should be used for drinking as well as for the bath and toilet. It is well, as an extra precaution, to disinfect the hands and face before each meal by using a solution of bichloride of mercury (one part to one thousand parts of water), taking care not to get any of the solution into the mouth or eyes. Especial attention should be paid to cleansing the beard, mustache, and nails. The mouth should be rinsed out with sterile water before eating.

The fæces, urine, and all clothing used by the sick should be disinfected in a solution of bichloride of mercury (one part to five hundred parts of water). Unless the bedding and clothing are of considerable value, they had better be destroyed by fire.

No uncooked food should be eaten. Ices and foods that are eaten cold are to be avoided unless their purity is beyond question. Musgrave has wisely suggested that nothing but hot water be allowed in the kitchen. When water is piped into the house this will be easy, but it will be difficult to obtain the cook's coöperation if he be a native or a Chinese. Flies must be excluded from the kitchen by screening the doors and windows. Covers of wire gauze should be provided for the dishes used in the kitchen, as even with the best screening it is

impossible to exclude all the flies. Watch your cook carefully, and be sure that his dishes and dish-cloths are boiled and not exposed to infection while drying.

Besides boiled water, tea, lemonade, and aerated waters of good quality that have been bottled more than one week may be drunk. Never drink water or tea that has ice in it. Pure ice is exposed to many chances of infection between the factory and the consumer, and the tropical product is rarely pure at the factory.

Dr. P. G. Woolley, of the Government Laboratory in Manila, has shown that the juice of a large lemon (not a lime) added to an ordinary glass of water will rapidly kill the germs of cholera. This is not absolutely safe, but when water that is not above suspicion is all that is available, it would be well to add the juice of one lemon to the water and let it stand for a short time before drinking. Lemon or lime juice in water frequently causes indigestion, and should not be used in excess.

During an epidemic it is well to avoid crowds, especially of natives, and as far as possible social gatherings where refreshments are served. Consult a physician upon the first appearance of looseness of the bowels. Avoid all fruit unless protected by a thick rind. Even these should be steril-

ized by being passed through boiling water before being eaten. Raw green vegetables should only be used when sterilized after the manner described under "Foods."

TYPHOID FEVER.

Typhoid fever is not strictly a tropical disease, and in some portions of the tropics it is rare, while in other sections it is quite common. It is caused by a germ which lives in the intestines of man suffering from the disease. It is discharged from the body in the fæces, the urine, and the expectoration. The disease is contracted by drinking water or eating food that has become contaminated with the discharges of typhoid patients. A few cases may be contracted by contact with such patients. Flies are one of the most usual means of infecting food.

Prevention consists in disinfecting the discharges from all typhoid patients with tricresol in solution of ten per cent., or with bichloride of mercury in strength of one part to five hundred of water. All clothing and bedding used by the patient should be thoroughly sterilized before being sent to the laundry.

Proper care of the drinking water and the exclusion of flies from the kitchen will prevent infection. Fruit and vegetables must not be eaten raw unless properly sterilized.

BERIBERI.

Beriberi rarely affects white people; as a rule, it is confined to the poor and badly nourished among the native population. It is very prevalent and very fatal in jails and other institutions where the poor are congregated.

The disease may be wet or dry, depending upon the amount of dropsy, but in both cases the nervous system is profoundly affected.

There are many theories as to the cause of the malady. One of the most popular attributes it to nitrogen-starvation. Dr. Hamilton Wright, from studies made in the jail at Kuala Lumpur, Federated Malay States, comes to the conclusion that the germ of the disease is introduced through the mouth, and that the earliest symptom is an inflammation of the small intestines. Acting upon this theory, he was able to eliminate the disease from the jail, although new cases were being constantly introduced from the infected area outside the institution.

His method is to disinfect and dispose of the fæces as has been described in treating of dysentery. All inmates of the jail are required to clean their hands and face before eating, and no one is allowed to eat in his cell. Defecation in the cell is also prohibited.

In addition to the measures advocated by Dr. Wright, persons having charge of jails, asylums, or other institutions in tropical countries should insist on a more liberal diet for those under their care, and should do all in their power to improve the sanitary condition of the institution.

PLAGUE.

The home of plague is said to be in India and portions of Africa, from where it has spread in great epidemic waves to Europe, South America, and Australia, and during the last few years it has made its appearance in the Philippines and in San Francisco, California. The "black death," which caused so many deaths in Europe about the middle of the fourteenth century, was in all probability the plague. Plague is a disease of the poor who live in unsanitary surroundings. In 1904 it caused in the Bombay Presidency, in India, 316,606 deaths,

and in 1905 the mortality for all of India was 878,602. In over one quarter of a million cases recorded in India there were only 19 cases among Europeans, 10 of whom died.

Plague manifests itself in three different forms. The bubonic form, in which there is swelling of the lymphatic glands, usually of the groin, is the most usual. Other forms are the pneumonic, where the lungs appear to bear the brunt of the disease; and the septicæmic, in which the germs of the disease early gain access to the blood. The last form is the most fatal. In all varieties there are fever and great prostration.

The germs of the disease are found in the excretions from the bodies of those suffering from the disease, and in the discharge from the buboes and in the expectoration from cases of pneumonic plague. Moderate heat and strong light quickly destroy the germs. Excepting in the case of pneumonic variety, the disease does not appear to be directly transmissible from man to man. The exact portal of entry into the human body is uncertain, although a large number of cases have been contracted by direct inoculation with splinters of wood from infected houses or from abrasions on the feet or hands. Rats, chickens, and other animals are

susceptible to the disease, and many epidemics are preceded by an epidemic and migration of the rodents. In India this is well recognized by the natives. Just what part the rat plays in the spread of the disease is unknown. Recent experiments by the Indian Plague Commission seem to confirm the belief that the fleas which live on the rat are the means of transmitting the disease. Others are of the opinion that the soil and dwelling in which the disease has existed become infected. Cockroaches have transmitted the disease to animals.

The personal measures to be adopted in a locality where the disease is present are as follows:—

Pay particular attention to personal cleanliness; avoid the infected area as much as possible; wear shoes even in the house; disinfect and protect with sterile gauze all wounds and abrasions; render the house rat- and mice-proof, and trap or poison any of the rodents that may be on the premises. During the last few years much has been done by administering protective inoculations. These inoculations protect in the same way that vaccination does, and, although not as efficient, they should be taken by those who are exposed to the disease. Very few of the inoculated take the disease, and in case the disease is contracted the mortality is

much reduced. As the germs of the disease are often found in the mouths of infected rats, all of the food supply should be so protected that the rodents cannot gain access to it. Under no circumstances should food that has been nibbled by rats be eaten.

The germs of the disease are given off from the body in the fæces, and all excreta and sputa must be disinfected before being thrown into the sink or otherwise disposed of.

In dealing with plague or any other epidemic among native people, particular attention should be paid to their social and religious customs. These people are strongly attached to their religion, especially to their burial rites, and if by chance the sanitary officer should transgress any of their customs he will find to his sorrow that the people will resent it, even though they die. More can be accomplished by diplomacy than by force.

TUBERCULOSIS.

Tuberculosis is very prevalent in the tropics. In the Philippine Islands there is hardly a house that has not harbored one or more cases. The hot, damp climate is favorable for the spread of the dis-

ease. Moreover, the methods of ventilation, or rather of not ventilating the homes of the natives, favor the spread of the infection. As a rule, the native keeps his house closed during the day, excluding the sunlight, and at night every window, door, and other crevice is closed to exclude the malaria. By excluding the light and air he is including the tubercular bacillus, which, although slower in its action than the malarial organism, is far more deadly.

In the prevention of tuberculosis the first great defence is a strong, healthy body. Next come the sanitary measures directed against the disease. These consist in disinfecting the expectoration of all persons who have the disease, and prohibiting spitting on the streets or in public places or in houses. The proper ventilation and disinfection of all buildings that have been occupied by those sick of the disease must be insisted on.

It will be a long time before the native of the tropics can be brought to such a degree of civilization that he will willingly coöperate with the health authorities in the crusade against the "white plague," but the day is not far off when he will screen his house to exclude mosquitoes and open the windows to the air and sunlight. Any one who

has had occasion to visit even the best of native houses after the family has retired is at once impressed with the necessity for ventilation.

With proper precautions there should be very little tuberculosis among the whites in the tropics. The climate is such that an outdoor life is almost a necessity, and by avoiding native houses and other unclean gatherings the chances of contracting the disease will be greatly reduced.

Persons who have had the disease should not go to the tropics.

ANIMAL PARASITES.

Animal parasites are very common in the tropics and are the cause of much sickness. Some of the diseases caused by these minute animals have been considered under malaria and dysentery.

Ankylostomiasis.

This is a very important disease that is not confined to the tropics, but prevails in certain parts of the temperate zone. In the United States many cases are encountered in the Southern States, especially Georgia.

It is caused by a minute animal that inhabits

the small intestines; where it fastens itself to the mucous membrane and abstracts blood from the surrounding tissues. After a time it shifts its hold to another place and leaves a bleeding point. Frequently there are several hundred of these worms in the intestines. Their eggs are passed with the fæces, and if deposited on damp soil undergo further development and are again taken into the body with drinking water or on food that has been contaminated by coming in contact with polluted soil. Lettuce and other green vegetables are frequently the medium through which the disease is contracted. Agricultural laborers and miners frequently infect themselves by handling their food with soiled hands. Probably the most frequent mode of infection is through the skin. In warm climates nearly all of the poorer children and many adults go barefooted and at some time or other suffer from what is called ground-itch. This has been proven to be nothing but an inflammation of the skin caused by the embryos of the worm. Many experiments have proven that the parasite can pass through the skin in a very few minutes. Doctors Ashford and King, as a result of several years of study in Porto Rico, have come to the conclusion that this is the most usual way of contracting the disease. They found

at least thirty per cent. of the deaths on the island were caused by the disease, and that a large proportion of the inhabitants are infected. The government of the island has taken up the matter and



Fig. 8.—Typical Facial Expression of the Sufferers from Ankylostomiasis. (From Ashford, King, and Igaravidez, Report of the Commission for the Study and Treatment of "Anæmia" in Porto Rico.)

has endeavored to eradicate the disease. The campaign was directed by Doctors Ashford and King along the following lines: Free hospitals and dispensaries were established, at which all cases that

presented themselves were treated and instructed in personal cleanliness and the proper disposal of their excreta. The inhabitants of the rural districts were also given instruction in this matter. Their results have been gratifying.

Personally one should avoid contaminated food and water and be particular about washing the hands and face and cleaning the nails before eating. Under no circumstances should green vegetables be eaten, unless sterilized according to the method given under "Foods."

Other Diseases Caused by Parasites.

Among the other animal parasites that infect the human body are the tape-worms, which are acquired by eating raw or partly cooked fish, beef, or pork.

Prevention consists in properly cooking these foods.

Round worms are very common in the tropics. In the Philippines nearly all of the native children harbor them, and as many as a hundred have been passed by one child. Their eggs are passed with the fæces, and if deposited in moist soil undergo development and are taken into the body with im-

pure water or vegetables or fruits that have been in contact with polluted water. By boiling the drinking water and sterilizing the vegetables, infection may be avoided.

Trichina are parasites that are found in pork and are not killed by ordinary pickling or smoking. When eaten with the flesh they undergo development in the intestines, and find their way to the muscles and cause an inflammation. Prevention consists in having the pork thoroughly cooked and in avoiding raw pork in any form.

SMALL-POX.

Small-pox is not a tropical disease, but is very prevalent in the tropics. In the town of Mangaterem, island of Luzon, twenty-six per cent. of the inhabitants were "pock-marked" and as many more who showed no marks claimed to have had the disease.

Vaccination is almost a sure protection for about five years. As an extra precaution, it is well to be revaccinated whenever the disease becomes epidemic in the vicinity. A typical vaccination scar is a whitish circle surrounded by a halo of pits. The large, depressed scars so proudly shown as suc-

cessful vaccinations are the result of some secondary infection and completely mask the true scar. After vaccination, keep the arm clean and be careful not to scratch or bruise it, especially after it begins to be "sore."

The exact nature of the infection of small-pox is unknown. It probably resides in the skin and is given off with the scales and scabs that form on the body. Those sick with the disease should be isolated at a distance of at least four thousand yards from a dwelling or public road.

NEURASTHENIA (NERVOUS PROSTRATION).

Osler defines this disease as "a condition of weakness or exhaustion of the nervous system, giving rise to various forms of mental and bodily inefficiency."

It is a disease of refined and highly cultivated and educated people, and is undoubtedly very common amongst the white residents of tropical countries.

The causes of the disease are varied. Most authorities agree that excesses, especially in the use of alcohol, are potent factors in the cause of the disease. Overwork, worry, and mental anxiety are

also causes. Major Woodruff, of the Medical Department of the United States Army, who has made a study of neurasthenia as seen in the Philippines, has come to the conclusion that exposure to the chemical rays of light is the principal cause. Any one who has felt the full effects of the tropical light during the hot season will agree that there is a solid foundation for Major Woodruff's theory.

The prevention of the disease consists in avoiding excesses of all kinds and leading as hygienic a life as possible. It is important to keep out of the direct or reflected light of the sun during the middle of the day. The working rooms and those used for the siesta should be darkened. The abuse of alcohol and loss of sleep are to be avoided. It is not advisable to exclude the light at all hours of the day, nor is it intended that no alcohol should be used. Alcohol is very useful in certain conditions to which the residents of the tropics are exposed, but, as has been said before, alcohol is a drug and should be used as such, and only on the advice of a physician and for a definite purpose.

Relaxing amusements, outdoor exercise, vacations spent in temperate climates, and a certain amount of systematic mental training will go a long way towards preventing the disease.

HEAT STROKE.

This name is applied to two distinct conditions, which are known to the medical profession as heat exhaustion and sunstroke or thermic fever.

Both conditions are very common in the tropics.

Heat exhaustion is a sudden faintness, with pale, cold skin and temperature below the normal. It is brought on by prolonged exertion in a hot, moist climate. The condition of the alimentary canal appears to have something to do with the condition, for it has been frequently noticed that when men are constipated they suffer more from the disease. It is not necessary that the person should be exposed to the direct rays of the sun.

It is best avoided by keeping the body in good condition, especially the alimentary canal, refraining from alcoholic drinks, and being properly clothed.

Sunstroke comes on suddenly. The face is flushed, the pulse is full, and the skin hot and dry. It usually follows hard work in the sun. Soldiers are particularly liable to be attacked.

It is best avoided by remaining in the house during the heat of the day. The head and spine

should be protected as directed under the section on clothing. When exposed to the sun, a large, white umbrella lined with green or scarlet should be carried. The eyes are to be protected from the glare by tinted glasses that afford protection to the sides as well as the front of the eyes. Drinking a moderate amount of cool water is also of service. It is not advisable to drink large quantities of water while exposed to the sun, as such a course is liable to be followed by vomiting and prostration.

During the day the rooms should be shaded without obstructing the ventilation. At night the windows are to be wide open, not the screens, to allow the maximum of ventilation.

SKIN DISEASES.

In warm countries the glands of the skin are very active and the skin is generally wet with perspiration. The moisture and high atmospheric temperature favor the growth of the parasites that are the cause of so many skin diseases. Great cleanliness and prompt disinfection of any cuts or abrasions tend to diminish the liability to these infections.

BOILS.

Boils and localized abscesses are very common and exceedingly difficult to heal. With few exceptions, they are due to infection through cuts or abrasions of the skin. One should keep on hand a solution of bichloride of mercury (one part to two thousand parts of water), or a solution of fifteen grains of boracic acid to an ounce of water, and some sterile gauze, and apply promptly to any such wounds.

DHOBIE ITCH.

Dhobie itch is probably the most common skin disease of the tropics. It is one of the varieties of ringworm and most frequently attacks the crotch or armpits. When the body becomes heated above the normal, the affected areas become very itchy and it is almost impossible to avoid scratching. The scratching spreads the infection to other parts of the body, and frequently large areas become infected. The parasites that cause the disease are quite commonly found on the skin of cats and other domestic animals. Europeans usually contract the disease through infected linen that has been washed in filthy pools or dried on infected plots of grass.

In order to prevent the disease it is necessary to see that the laundress uses only pure boiled water and that the garments are hung on clean lines. The washerwoman should be provided with plenty of good soap and required to use it. Sir Patrick Manson recommends the use of a powder of equal parts of boracic acid, zinc oxide, and starch, rubbed under the arms and between the legs after the bath. Borated talcum may be used for the same purpose.

On the appearance of the disease a physician should be consulted at once. If none be available, an alcoholic solution of salicylic acid (sixty grains to the ounce) may be applied. It will cause some pain, but will promptly cure the disease.

PRICKLY HEAT.

Prickly heat is a very annoying and in some cases a serious disease. It is an inflammation of the glands of the skin, and is aggravated by anything that causes increased perspiration, especially hot drinks. It is best relieved by keeping cool and applying one of the powders just mentioned. Often a cool bath will work wonders, but no soap must be used. Occasionally the disease is so severe that a change to a cooler climate becomes necessary.

YAWS.

Yaws is rarely found among white men, but it is very common among the natives in certain parts of the tropics. It is very infectious, the infection clinging to the house long after the last case has recovered. This is to be borne in mind when compelled to live in native huts, and if possible the house should be disinfected. If the floor be of dirt, it should be removed and replaced by clean, dry sand. The earth for some distance around the house should be dug up and replaced by sand. All persons suffering from the disease should be isolated until well, and all dressings and cloths that come in contact with the ulcers must be destroyed.

LEPROSY.

Leprosy is rarely contracted by intelligent white persons. It is probably only transmitted by direct contact with the disease, which, because of its loathsomeness, few whites encounter.

The garments worn by persons with leprosy should be disinfected, and all discharges, especially from the nose and the ulcers, must be disinfected, preferably by burning. Those afflicted with the disease should be segregated under government control.

VENEREAL DISEASES.

The venereal peril is very great in the tropics. The life for many is very lonely, and one is often deprived of the company of respectable women and continuously thrown with a population having relaxed morals. Many fall, and unless one be on guard it is easy to depart from the standards of morality maintained at home and fall from the seat of virtue. It is of the greatest importance to prevent the first fall, for once the barrier is broken down the downward path is easy and alluring.

Venereal diseases are rarely contracted excepting during illicit intercourse. At least one-third of the public women are infected, and a man who keeps company with them will sooner or later contract one of the venereal diseases.

To prevent venereal disease, avoid all illicit intercourse. Many men and not a few physicians claim that this is impossible. The best answer to this is in the words of Colonel Valery Havard, who says: "It is also necessary to dispel an absurd idea, sometimes amounting to a belief, fostered by our own misguided instincts, and supported by the opinion of not a few thoughtless physicians, that continence is not possible for a man, and that, fur-

thermore, sexual relations are necessary to health. If so, why is continence possible for many unmarried men about us, or of our acquaintance, whom we know to be virtuous? Our own conscience and experience tell us that we can abstain if we want to; that we have the necessary will-power if we wish to use it. As to the effect of continence upon the health, Professor Alfred Fournier, of Paris, an old specialist, who probably knows as much of this subject as any living man, says: 'Referring to the so-called dangers of continence, I must confess that I do not know them and that I have never observed them.' "

If the man alone suffered, we might forebear; but too often the children and the innocent mother share the pains that follow a fast life during youth. A great many of the diseases peculiar to women encountered in married women are caused by gonorrhœa, contracted from the husband, who, un-awares, was suffering from gleet, which is chronic gonorrhœa. A man who respects himself should pause and consider whether, for a few moments' pleasure, he is willing to run the risks of contracting a disease that may make him an invalid for life or be transmitted to the woman he loves, and cause her to submit to a dangerous operation which

may leave her an invalid. Colonel Havard says: "In the cultivation of continence and purity, the two most important rules of conduct are:

"1. To banish immoral, lascivious thoughts from your mind, for thoughts long entertained and in which we take pleasure will inevitably lead to desires, and desires to acts.

"2. To keep out of the way of temptation; avoid all companions whose thoughts and desires are towards debauchery, for their words and examples are alike pernicious; avoid all disreputable places of amusement, especially those which prostitutes frequent and where the only object of the management is to make money by pandering vice; but, above all, avoiding liquor, for drink, except in great moderation, will surely lead you to other vices, especially the one under consideration."

In addition to the above, one should seek the company of respectable people and be occupied all the time. When not at work, indulge in athletic games.

VENOMOUS SNAKES.

In most temperate and nearly all tropical countries there are many venomous snakes. In India the annual mortality from snake-bites is es-

timated at about twenty thousand. Even in tropical countries a majority of the snakes are not poisonous. Harmless snakes have two rows of ungrooved teeth in each jaw. Venomous snakes, on the other hand, have but one complete row, the outer row being represented by two or three grooved fangs that are covered with a fold of mucous membrane when the animal is quiet. The wound made by the venomous reptile shows two or more isolated punctures.

Over ninety per cent. of all snake-bites are on the extremities, usually the lower. When liable to encounter snakes, the lower extremities should be protected by heavy boots or leggins. If bitten, the part above and below the wound should be ligated and the wound sucked. When drugs are to be had, a few drops of a one per cent. solution of chromic acid should be injected into and around the wound. Injections of potassium permanganate in one per cent. solution are good, but not as efficacious as the chromic acid. Ammonia applied locally is also useful. Systemic treatment should consist of large injections of strychnine, and artificial respiration. Alcohol and ammonia internally have been much lauded. The former is usually taken in such quantities that the vitality is greatly depressed, and I

know of one case where so much whiskey was taken that the man died of delirium tremens. Ammonia is the better of the two. The antivene of Calmett may be used in doses of from ten to twenty cubic centimeters when available, but under no circumstances should the local treatment be delayed. Prompt local treatment is more effective than all the drugs on earth.

FLIES AND OTHER INSECTS.

The subject of mosquitoes has been considered under malaria, yellow fever, and filaria.

Flies are very numerous wherever there are warmth, dampness, and decaying animal and vegetable matter. The common house-fly breeds in stable-manure. Each female lays about one hundred and twenty eggs at a time, and her offspring at the end of a season in the temperate zone has been estimated at twenty-five millions.

Many epidemics of typhoid fever, cholera, and other diseases have been traced to infection carried by flies. Certain flies are concerned in the propagation of sleeping sickness, while others harbor the animal that causes surra, that most fatal disease of horses.

Myiasis is a disease caused by the larvæ of flies. The eggs are frequently laid in the ear, abrasions of the skin, and in the nasal cavity. When the latter is the case, the condition produced is very serious and unless promptly treated death rapidly follows. Occasionally the eggs are laid on food and develop in the intestines, causing a sharp diarrhœa.

The prevention of myiasis consists in protecting all wounds so that flies can not get at them, and sleeping under a net.

The number of flies around the house can be greatly reduced by keeping the premises absolutely clean. No droppings of animals or decaying vegetable or animal matter should be allowed to accumulate. Especial care should be taken to keep flies out of the kitchen, and no food should be left uncovered longer than absolutely necessary.

Bedbugs have frequently been accused of being the means of spreading disease, but so far they have been acquitted. Nevertheless they are a terrible plague in some parts of the tropics, as well as in the temperate zone, and in many instances the bites cause much discomfort. They are as often found in the crevices of the wall as in the bed. When the bed is infested, they may be dispelled by

filling all cracks with any of the following fluids: twenty per cent. solution of carbolic acid, solution of bichloride of mercury (1 to 500), or refined coal-oil. The application should be repeated every few days until the bed is entirely free. Iron beds are rarely infested with bedbugs.

When the walls of the room are infested they should be scrubbed, all cracks filled in with putty, and the walls repapered or calcimined. Fumigations with sulphur are often of service in ridding the room of the pests. Insect powders are usually a failure.

Ticks are not only a nuisance, but one variety, that lives in the cracks of houses and in habits resembles the familiar bedbug, is the means of transmitting relapsing fever. In a country where ticks exist, old camping-grounds and deserted shacks must be avoided. They bite at night, but a good mosquito-net well tucked under the bed will afford protection. It is well to search the net, to see that none of the pests are secreted in its folds.

ANTS.

In the tropics ants cause not a little annoyance and do no end of damage. The most destructive

is the white ant, which attacks almost all kinds of vegetable fiber. Their especial delight is to get into a library or a chest of books. In a very short time they will destroy a book, and it is not uncommon to find chests and packing boxes completely riddled by them. The Philippine Treasury lost \$1,000,000 worth of revenue stamps from that cause. They were in an iron safe that was incased in thirty inches of cement on all sides; nevertheless the insects found an entrance through some crack or crevice and destroyed everything in sight. Mr. C. S. Banks, of the Philippine Bureau of Science, is authority for the statement that two coats of "carbolineum" will protect woodwork from their ravages for about two years.

The small red ant is also very destructive and is found in almost every house in some portions of the Philippines. To keep them from the tables, the natives place the legs in small cans containing kerosene oil. I have noticed that they will not come on to floors that have been polished with kerosene oil, and would advise the householder to apply a little of that to the floor at frequent intervals.

No doubt ants are one of the means of spreading such diseases as tuberculosis. They are fre-

quently found on food, and one has but to spit on the ground to be convinced that it is not impossible for them to carry any infection that may be in the spittle.

CARE OF CHILDREN.

With white children in the tropics my experience has been somewhat limited. Most of those who came under my notice thrived. Yet on returning to the temperate zone one was at once struck by their anæmic appearance when compared with other healthy children.

One can not be too particular about the diet of children. If possible, they should be nursed. Where this cannot be done, every endeavor should be made to obtain a healthy cow, and, failing in this, several good goats. Goats are rather filthy feeders and should not be allowed to run at large.

Everything that comes in contact with the milk must be very clean. Before milking, the hands must be washed with soap and water and then in sterile water. The milk-pail and all pans should be sterilized, and as soon as possible the milk should be placed on the ice. Under no circumstances should the cow be milked or kept in a dirty barnyard or

the best place for the
milk.

The only good milk cannot be had, re-
served for the child. This usually
comes from the cow's udder; but it
is not so good as a very pure milk, and as
soon as it is taken from the udder it
should be substituted.
Condensed milk contains a large amount of sugar
and is not a good substitute for germs. It
should be handled with care. The prac-
tice of using it in the house is only mentioned by
some authorities. As soon as opened the milk
should be poured into a sterile bottle with a wide
mouth and a screw cap, which should be kept on
the top. The nursing-bottles and the nipples should
be sterilized and boiled immediately after being
used. Rather than consume the condensed milk, the
milk should be taken to some place where cow's
milk can be obtained.

There is a tendency on the part of mothers to
keep their children in the house too much. While
it is not desirable to expose them to the full action
of the sun or the tropical light during the heat of the
day, they should be kept in the open air as much
as possible. The shaded veranda or under the trees
in the garden should be their playground. Native

children are not desirable playmates, as they are usually infected with malaria and skin diseases. Their homes are infested with mosquitoes and must be avoided.

APPENDIX I.

In this appendix are given a few hints on the treatment of some of the more common diseases met with in the tropics, also a few remarks on poisons and the treatment of poisoning.

These remarks are not intended to encourage persons to do without a physician; but as there are many places in the tropics where medical attention cannot be had, it is necessary for those who make their home in such a locality to have some knowledge of the treatment of the more common diseases. The reader is advised to consult a physician whenever possible. Many a serious malady starts with mild symptoms, and if properly treated at first may be cut short.

Persons are cautioned not to use opium, paregoric, or laudanum in the treatment of diarrhœa or pain in the abdomen. These drugs relieve the pain and check the diarrhœa, and in most instances do more harm than good. The use of bismuth and other astringents in dysentery and diarrhœa is usually a two-edged sword that generally cuts the wrong way. Especially are the nostrums so highly advertised in the daily papers to be avoided. Re-

cent investigations have shown that in the majority of cases their only virtue is due to the cheap alcohol they contain. If you need an alcoholic stimulant, use a pure article that is sold under its own name.

THE TREATMENT OF SOME OF THE MORE COMMON DISEASES OF TROPICAL COUNTRIES.

The practice of treating one's self, while discredited in places where competent medical advice can be obtained, becomes a necessity in many parts of the tropics. At best it should be but a temporary procedure, and a physician consulted as soon as possible.

Diarrhœa.—Diseases of the digestive system that are characterized by diarrhœa will probably be the most frequently encountered. It is to be remembered that diarrhœa is Nature's method of ridding the system of the poisons that are in the intestines, and nothing should be done to prevent the elimination. Such cases are best treated by an ounce of sulphate of magnesia or a similar dose of castor-oil. This, combined with rest in bed and a diet of milk, broth, or egg-water, will usually cure a simple case of diarrhœa. (Egg-water is made by stirring the white of an egg in a glass of cold

water.) It is not advisable to administer astringents, such as bismuth, tannic acid, or preparations of opium, in such cases. Many physicians are of the opinion that the use of astringents frequently results in the case becoming chronic.

Diarrhœa is often a symptom of serious disease, and unless it yields to the above treatment in twenty-four hours a physician should be consulted.

Dysentery.—If the bowels be loose and the movements contain blood or mucus, or if there be straining at stool, the disease is in all probability dysentery. Until the physician comes, put the person to bed, give an ounce of magnesia sulphate, and the diet prescribed for diarrhœa. These cases do better on milk; soups appear to increase the looseness of the bowels. From a slight attack of the disease the recovery may be prompt; but if the illness be prolonged, a change of climate is indicated, and should at once be had at almost any cost. Experience in the Philippines has demonstrated that the chances of recovery in that climate are very slight.

Worms.—Infection with round worms is quite common. The first indication that the condition exists is usually the passage of one or more of the worms. These animals are promptly expelled from the intestines by from one-half to two grains of

santonin given at bedtime, followed in the morning by from two to five grains of calomel or an ounce of castor-oil.

Sick Headaches.—These are not uncommon in the tropics. They are frequently symptoms of diseases of the eye or of the nose. Probably the most common cause is an error in diet. It is best to consult a physician; but if none be available, the immediate attack may be treated as follows: As soon as the first symptoms appear take an enema of warm water and soap-suds. If the stomach be irritable, drink freely of warm water and take from two to five grains of calomel. If the stomach be not irritable, take an ounce of sulphate of magnesia. A hot bath should be taken and the patient put to bed in a cool, dark room, and made to drink freely of cool water, preferably cool carbonated waters. No food should be taken until the attack is over, unless it lasts for more than one day. In such a case it becomes necessary to give a small quantity of peptonized milk, or malted milk; or if these be not at hand, plain milk will have to be used. The condition rarely lasts more than twenty-four hours. Cases that continue longer are usually some other disease, and a physician must be seen at once.

Fevers.—It is the custom to charge all fevers

encountered in the tropics to malaria. In a large number of cases the diagnosis is correct.

Malaria manifests itself in many ways. The most marked symptom is a chill, followed by a fever and a period without symptoms. This cycle recurs every forty-eight or seventy-two hours. In such cases the diagnosis is easy, and the treatment may be begun promptly. The usual treatment is to give five or ten grains of quinine every two hours until the ears begin to ring or the fever is broken. The treatment should continue for several days after the fever is broken. Later, the dose of quinine should be reduced to five grains three times per day for two weeks. For the next month the same quantity of quinine should be taken every other day. Quinine is best administered in liquid form. The tablets that are usually provided are so hard and the digestive fluids so much weakened that frequently the tablets are passed through the body without being changed. At the beginning of the treatment the bowels should be opened with a dose of magnesia sulphate or one of calomel.

Snake-bites have already been considered. See page 93.

Heat Stroke.—The person attacked has a flushed face, full bounding pulse, and a hot, dry

skin. The temperature is very high. This condition always demands the best medical skill, and a physician should be summoned at once. Before he arrives, the patient should be placed in a cool place, preferably a cold bath, and cold water poured over the head. The head should be higher than the rest of the body. The bowels should be opened by an enema or a dose of salts. No stimulants of any kind should be given.

Heat Prostration.—In this disease the patient has a weak pulse, is pale, with a cold, clammy skin. This person needs a stimulant, such as aromatic spirits of ammonia (one or two teaspoonfuls) in water, hot coffee, or hot beef-extract. Keep him in a cool place, with his head lower than the body. Cover with a light blanket, and apply hot bottles to the feet if necessary.

Cuts and Bruises must be dressed with sterile gauze held in place by a bandage. If there is dirt in the wound and no physician be available, flush it out by pouring warm, boiled water into the wound. Never touch it with the hands. Sterile gauze may be purchased from any reliable drug store, or ordinary cheese-cloth, cut into squares of four inches, may be placed in a wide-mouth bottle filled with water. Place the bottle in a boiler and

let it boil for at least an hour. Then pour off the water and place in a moderately warm oven until all the water has been dried out; the top of the bottle should then be replaced. Place the gauze over the wound without touching more than the corner. For small wounds this is all the dressing that will be required; larger ones may require dressing every day, depending upon whether they are infected or not.

Sore Eyes.—Foreign bodies, such as cinders, usually lodge beneath the upper lid, from whence they may be removed by turning the lid inside out and brushing away with a soft cloth. The eye should then be washed out with a few drops of saturated solution of boracic acid in water. If there is much inflammation, the drops should be placed in the eye every hour and the patient confined to a darkened room or the eyes be protected by dark glasses.

The intense glare of the tropical light often causes serious disease of the eye. In any case where there is an inflammation of the eye, or pain or loss of vision, either partial or complete, a physician, preferably one who devotes his time to diseases of the eye, should be consulted. In the meantime the glare must be avoided, either by the use of colored glasses or by remaining in a darkened room.

POISONS: THEIR ANTIDOTES AND THE TREATMENT OF THE MORE USUAL CASES OF POISONING.

In these days, when poisons in the shape of liniments, lotions, and disinfectants are found in most houses, it is not uncommon to find persons taking them, either by mistake or by design.

All bottles or boxes that contain poisons should be labeled "Poison" and marked plainly "External Use," or some similar label that will call attention to the nature of the contents. In addition, they should be kept under lock and key and in a place separate from the usual household remedies.

Solutions of bichloride of mercury generally have the color and appearance of water, and must never be placed in a glass or cup. Some coloring matter should be added to such a solution, so as to attract the attention and prevent any one from drinking of it.

In the treatment of poisoning, the most important things are to remove the poisonous substance from the body and to administer an antidote.

The emetic that is most generally at hand is mustard, which may be administered in doses of two tablespoonfuls in half a pint of warm water, to

which has been added sufficient salt to make the concoction have a decidedly sickening taste. Alum in from two- to five-grain doses is also a good emetic. Vomiting may be produced by tickling the throat with a feather or by passing the finger down the throat as far as possible. If there be a stomach-tube at hand, it may be used.

The antidote may be mixed with the emetic; but if it be not at hand, the emetic must be given promptly.

After the poison has been removed from the stomach, treatment to repair the damage done or to allay any inflammation caused by the drug may be instituted.

A physician should be called as soon as possible, but treatment, such as administering an emetic and the antidote, must be begun without waiting for his arrival.

The following is an alphabetical list of some of the more usual poisons, with their antidotes and the appropriate treatment of poisoning by them.

Acids, Acetic, Hydrochloric, Sulphuric, and Nitric.—The antidote is an alkali, such as magnesia or chalk; in an emergency soap-suds or the whitening scraped from the wall or whitewash will do. These must be given in large quantities of milk or

water, and followed by soothing drinks, such as mucilage and water, olive or other oils.

Acid, Carbolic.—The antidote is Epsom salts (sulphate of magnesia) in abundance, several ounces in water. If this be not at hand, lime suspended in syrup may be given. Alcohol may be administered internally but not unless vomiting can be produced or the stomach emptied with a tube. Soap may be used when other antidotes are not available. The antidote must be followed by a large drink of milk or eggs. If the acid be spilled on the skin, flushing with alcohol will promptly relieve the pain and limit the damage done by the acid.

Acid, Oxalic (Salts of Lemon).—The chemical antidotes are finely-divided chalk, magnesia, or magnesia carbonate, suspended in large quantities of water. If near a whitewashed wall or fence, scrape it and administer the lime. An emetic, such as mustard (two tablespoonfuls), must be given promptly, but the stomach-tube must not be used.

Aconite.—The antidote is tannic acid in dose of 60 grains, followed by an emetic. If the acid be not at hand, use strong tea or an infusion of hay. The case calls for the administration of stimulants, such as brandy or whiskey.

Alcohol (Whiskey, Brandy, and Other Drinks).

—The treatment of poisoning by any of these is to give an emetic and to douche cold water on the head, applying warmth to the body and maintaining artificial respiration if necessary.

Alkalies (Ammonia, Spirits of Hartshorn, Concentrated Lye, Caustic Potash, or Soda).—The antidotes are weak acids, such as vinegar, lemon or orange-juice; milk, olive-oil, melted butter, and lard. The stomach-tube must not be used, as the walls of the stomach and gullet are corroded, but an emetic should be given.

Arsenic (Fowler's Solution, Paris Green, "Rough on Rats").—The first thing to do is to empty the stomach by the use of the stomach-tube or by an emetic. The antidote is made, in an emergency, by mixing an ounce of the tincture of the chloride of iron in a tumbler of water and adding magnesia sulphate, washing- or baking-soda, or ammonia. If the soda or ammonia be used, it will be necessary to strain the solution through a handkerchief and wash the precipitate in clean water before taking. After the antidote has been given and the stomach washed out, soothing drinks, such as oils, milk, or eggs, should be given. The bowels should be opened by a dose of castor-oil.

Atropine is the alkaloid of *belladonna*, and is considered under that drug.

Belladonna and Atropine.—The antidote is tannic acid in doses of sixty grains. In the absence of the acid, strong tea, which contains a large proportion of the acid, should be given. The antidote should be followed by an emetic. Cold to the head and hot coffee are also useful.

Chloral is treated in the same manner as opium.

Copper (*Bluestone, Blue Vitrol, Verdigris*).—The treatment is to give an emetic, followed by white-of-egg and milk.

Corrosive Sublimate (*Bichloride of Mercury*).—Poisoning by this drug should be treated by an emetic, followed by white-of-egg or other albuminous substance, milk, or tannic acid. The stomach-tube is not to be used, as the walls of the stomach are badly corroded. The combination of mercury and albumin is rapidly dissolved and is poison, and should therefore be removed from the stomach as soon as possible.

Iodine.—The treatment of poisoning by iodine is to administer starch or flour mixed with water and followed by an emetic; later, soothing drinks should be given.

Laudanum.—See opium.

Lead (Sugar of Lead).—Wash out the stomach with a large amount of magnesia sulphate in water. If the stomach-tube be not at hand, vomiting may be produced by giving one or two grains of alum immediately after the magnesia. The bowels must be kept open.

Matches.—See phosphorus.

Morphine.—See opium.

Opium (Laudanum, Morphine, Paregoric, Soothing Syrups, and most Painkillers).—As soon as possible after the poison has been taken, an emetic should be administered, but unfortunately it rarely acts. The antidote is permanganate of potash in doses of five grains in water, followed by hot coffee. The patient must be kept awake by being walked about, and if necessary, flayed with a wet towel. A physician should be called at once.

Paregoric.—See opium.

Paris Green.—See arsenic.

Phosphorus (Match-heads and occasionally Rat-poisons).—The antidote is permanganate of potash, which should be given in dose of five grains in a pint of water. If the stomach-tube be not at hand, an emetic may be given. After it has acted, an ounce of sulphate of magnesia (Epsom salts)

should be given. No milk or oil of any kind should be given, as oils dissolve the phosphorus.

Poisonous Plants (Mushrooms, Jimson Weed, and others).—If these plants have been eaten, an emetic should be given, followed by sixty grains of tannic acid.

Silver (Nitrate of Silver, Lunar Caustic).—The antidote for silver is table salt, followed by an emetic and later by the whites of eggs.

Strychnine (Nux Vomica).—The antidote is tannic acid, followed by an emetic. The patient should be kept absolutely quiet and not exposed to a draught. Bromide of potash in doses of fifteen grains should be given, to control the convulsions, but a physician should be called at once.

APPENDIX II.

In the following pages are given a few meteorological tables, from which may be gathered a fair idea of the climate of those portions of the torrid zone that are under the American flag. Those who wish to go deeper into the subject should consult the publications of the United States Weather Bureau, the Philippine Weather Bureau, and the Hawaiian and Porto Rican Sections of the United States Weather Bureau.

In the following tables the temperature is expressed in degrees of the Fahrenheit scale, humidity is given in percentages of saturation, rainfall in inches and hundredths, and the clouds in tenths, 10 being cloudy and 0 clear.

Summary of Meteorological Observations Taken at Honolulu, Hawaii.

	Mean Temperature	Maximum Temperature	Minimum Temperature	Mean Relative Humidity	Average Rainfall	Average Number of Rainy Days	Mean Cloudiness
January,	70	81	53	74	3.01	15	4.4
February,	70	82	52	71	5.41	16	4.9
March,	71	83	56	72	4.04	18	4.6
April,	72	85	60	73	2.82	17	5.1
May,	74	87	59	70	2.55	19	4.4
June,	76	88	64	70	1.49	19	4.0
July,	77	87	65	68	1.79	19	4.0
August,	78	87	63	70	1.99	18	4.0
September,	78	87	66	70	2.12	18	4.0
October,	76	87	64	74	2.79	19	4.3
November,	74	86	59	73	5.14	17	4.6
December,	72	83	55	76	4.41	16	4.4

Honolulu has a warm, moist climate with an abundance of sunshine. The northeast trade-wind blows during 256 days in the year. In the summer this wind is particularly strong, being felt on an average of 29 days in July and August.

**Summary of Meteorological Observations Taken at Manila,
Philippine Islands. Situated on the West Coast of
the Island of Luzon.**

	Mean Temperature	Maximum Temperature	Minimum Temperature	Mean Relative Humidity	Average Rainfall	Average Number of Rainy Days	Mean Cloudiness
January,	77	93	62	78	1.19	5	4.6
February,	78	96	61	74	0.41	3	3.8
March,	80	96	63	72	0.74	3	3.8
April,	83	99	66	71	1.14	4	3.5
May,	83	100	71	77	4.20	9	5.1
June,	82	97	71	82	9.62	16	6.8
July,	81	95	70	85	14.57	21	7.5
August,	81	94	69	84	13.87	20	7.5
September,	80	94	70	86	14.93	20	7.4
October,	80	95	69	83	7.54	16	6.1
November,	79	92	65	82	5.13	12	5.8
December,	77	92	60	81	2.13	8	5.6

The climate of Manila is hot and moist during the greater part of the year. During the spring months it is dry. The afternoon temperature of the hottest portion of the year is modified by the northeast trade-winds that prevail at that season.

Summary of Meteorological Observations Taken at Aparri, Philippine Islands. Situated on the Extreme Northeastern Coast of the Island of Luzon, Near the Mouth of the Cagayan River.

	Mean Temperature	Average Rainfall	Average Number of Rainy Days
January,	74	9.09	12
February,	75	3.90	6
March,	77	1.93	6
April,	80	1.10	3
May,	82	2.64	5
June,	83	2.28	5
July,	82	5.08	8
August,	82	6.85	10
September,	81	9.53	12
October,	80	11.26	11
November,	77	9.49	15
December,	74	10.43	16

Summary of Meteorological Observations Taken at La Carlota, Philippine Islands. Situated in the Western Part of the Island of Negros.

	Mean Temperature	Average Rainfall	Average Number of Rainy Days
January,	78	2.32	6
February,	79	2.13	4
March,	80	1.85	4
April,	82	3.42	7
May,	82	9.02	14
June,	81	11.61	19
July,	79	13.86	20
August,	79	14.88	20
September,	79	14.88	19
October,	80	13.58	18
November,	79	7.83	14
December,	79	5.00	10

**Summary of Meteorological Observations Taken at Zamboanga,
Philippine Islands. Situated on the Southwestern
Coast of the Island of Mindanao.**

	Mean Temperature	Average Rainfall	Average Number of Rainy Days
January,	80	1.61	11
February,	79	1.06	7
March,	81	2.28	9
April,	81	0.86	5
May,	82	3.40	10
June,	82	6.45	12
July,	82	3.70	12
August,	81	1.54	9
September,	81	2.91	10
October,	81	3.78	13
November,	80	2.95	11
December,	81	4.40	11

Summary of Meteorological Observations on the Isthmus of Panama.

	COLON		PANAMA AND LA BOCA	
	Mean Temperature	Average Rainfall	Mean Temperature	Average Rainfall
January,	79	3.89	79	0.70
February,	79	1.44	80	0.73
March,	80	1.58	81	1.65
April,	80	4.32	82	2.84
May,	80	12.04	81	7.53
June,	80	13.50	81	7.86
July,	80	16.70	80	7.58
August,	79	15.31	79	6.81
September,	80	12.68	80	7.48
October,	79	14.15	78	9.49
November,	79	20.69	78	11.57
December,	80	12.14	80	2.75

Summary of Meteorological Observations Taken at San Juan, Porto Rico.
 San Juan is Situated on the Northeastern Coast of the Island.
 Its Elevation is About 80 Feet Above the Sea.

	Mean Temperature	Maximum Temperature	Minimum Temperature	Average Rainfall	Average Number of Rainy Days
January,	75	86	66	2.97	17
February,	75	89	66	2.37	8
March,	76	89	65	2.32	16
April,	77	93	66	3.59	13
May,	79	94	66	3.67	16
June,	81	93	70	4.87	20
July,	81	89	70	5.74	22
August,	81	91	70	5.89	19
September,	81	93	71	5.13	18
October,	80	91	63	6.18	19
November,	78	89	69	6.50	19
December,	78	88	65	4.30	18

The daily range of temperature varies with the locality and elevation, being between 11 and 12 degrees at San Juan, and as much as 20 degrees at more elevated stations. The rainfall in Porto Rico comes mostly in brisk showers of short duration. A series of wet days is almost unknown. The humidity is said to be quite high.

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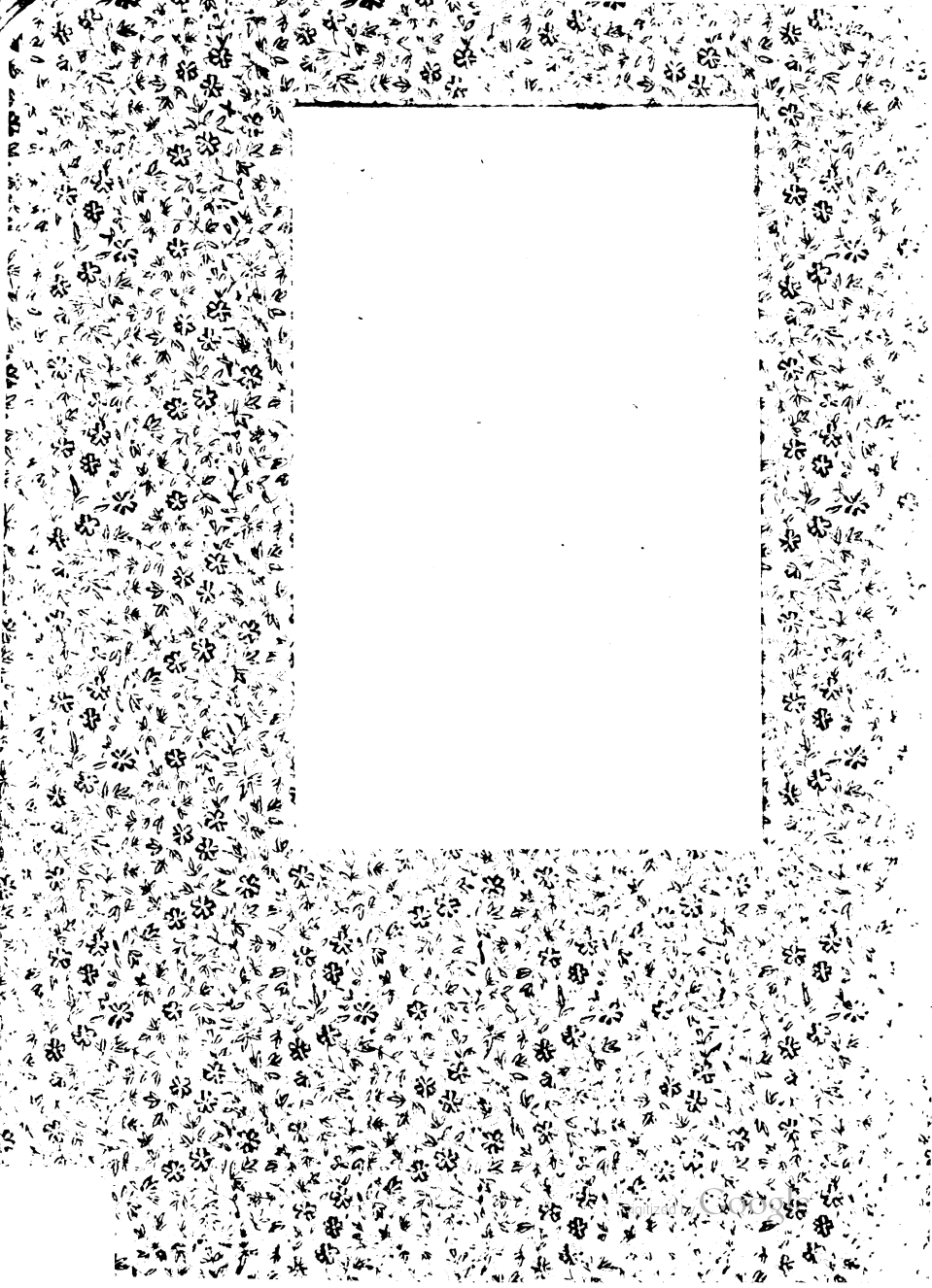
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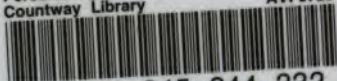
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